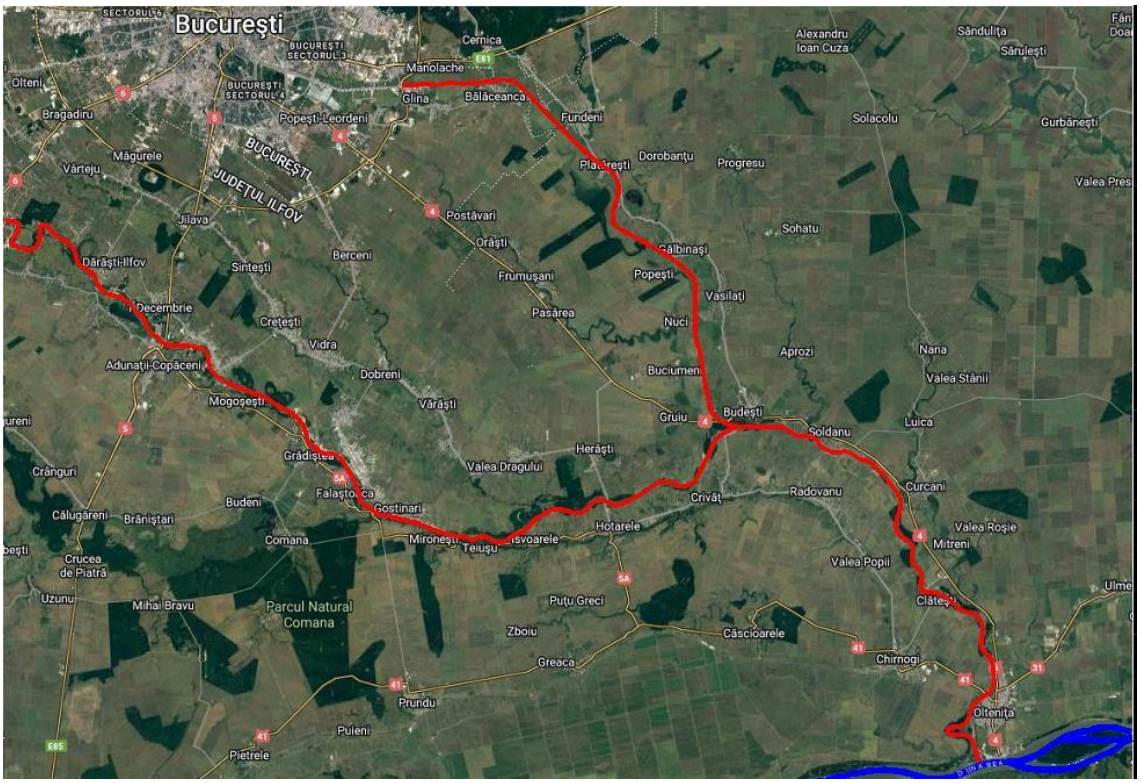
UNIUNEA EUROPEANĂ

Instrumente Structurale 2014 - 2020

UPDATE OF FEASIBILITY STUDY FOR THE INVESTMENT OBJECTIVE "RIVER CONTROL WORKS ON ARGES AND DÂMBOVIȚA RIVERS FOR NAVIGATION AND OTHER USES"

Documentation to obtain the Environmental Impact Permit

ENVIRONMENTAL IMPACT REPORT



Contract No.:	**1757/11 January 2023**
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Beneficiary:	**COMPANIA NAȚIONALĂ ADMINISTRAȚIA CANALELOR NAVIGABILE S.A.**
Main Authorizing Officer/Investor:	**MINISTRY OF TRANSPORT AND INFRASTRUCTURE**
GENERAL DESIGNER	**S.C. AQUA PROCIV PROIECT S.R.L.**

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1. GENERAL INFORMATION

1.1 Name of the investment objective

RIVER CONTROL WORKS ON ARGES AND DÂMBOVIȚA RIVERS FOR NAVIGATION AND OTHER USES

1.2 Designer of the works

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1.3 Beneficiary of the works

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2. Project description

2.1 Project overview

The project underlying this Environmental Impact Report is an update of the study approved by the Technical and Economic Committee of the Ministry of Transport and Infrastructure by Approval No 71/80 of 19 July 2012 and by the Interministerial Council for the Approval of Public Works of National Interest by Approval No 42 of 17 August 2012.

The water link between Bucharest and the Danube has been of interest since the end of the 19th century. In **1929,** the Romanian Parliament adopted the "Law for the Construction of the Argeș - Bucharest - Danube Canal". The economic recession of 1930-1933 and the pre-war situation made it impossible to start its construction.

After 1960, new studies were conducted on the water link from Bucharest to the Danube.

Since the floods between 1970 and 1980 caused major damage, in **May 1982** the Ministry of Transport and Telecommunications was given the task of drawing up studies and documentation for the development of the river control works on Argeș river. In **July 1984,** Bucharest was linked to the Danube by the Argeș and Dâmbovița rivers.

In **1986** works began under the project "River control works on Argeș river for navigation, irrigation and other uses" and in **1988** on the Dâmbovița River.

In **January 1990,** when work on the Argeș and Dâmbovița rivers was at a very advanced stage, **they were suspended** and abandoned due to a lack of financial resources.

In September 2009, the Feasibility Study for the "*River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses*" was contracted. The vandalization of the concrete constructions and the degradations found in place made it necessary to prepare technical expert reports on them in order to enable the further preparation of the FS.

The Feasibility Study has been approved by the Technical and Economic Committee of the Ministry of Transport and Infrastructure by Approval No 71/80 of 19 July 2012 and by the Interministerial Council

for the Approval of Public Works of National Interest by Approval No 42 of 17 August 2012.

Consultations with the Ministry of Public Finance have been carried out in order to finalise the draft government decision for the approval of the objective and to put it on the approval circuit. It was established that the objective should be promoted for approval by two government decisions, one for the approval of the expropriation corridor and one for the technical-economic indicators, and that the Ministry of Transport (MT) should have identified the source of financing.

On 02 September 2020 the Minister of Transport and Infrastructure approved the Notice of opportunity on the inclusion in the National Recovery and Resilience Plan of the investment objective "*River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses*".

On 21 October 2020, the Minister of Transport and Communications Infrastructure signed Order No 1940 approving the Memorandum on the necessity and appropriateness of incurring expenses related to the updating of the feasibility study for the investment objective: *"River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses".*

In order to document the technical offer with site data, the tenderer visited the site.

At the time of the site visit by the tenderer in the presence of the Beneficiary's representative, the vegetation was overgrown, preventing access to some works.

Following the site visit, photographs were taken of the works in various states of disrepair/conservation, as can be seen in the photographs below.

- **STEP LOCATED AT KM 73+289**

The left bank



The right bank



- **PORT OF 1 DECEMBRIE**



❖ **Unfinished works at Km 68 on the Argeș river**



❖ **HYDROTECHNICAL NODE OF COPĂCENI**




- **GRĂDIȘTEA**




- **HN3 OF GOSTINARI**




- **HN2 OF BUDEȘTI**



❖ **HN1 OF OLTENITA**



❖ **PORT OF OLTENIȚA**

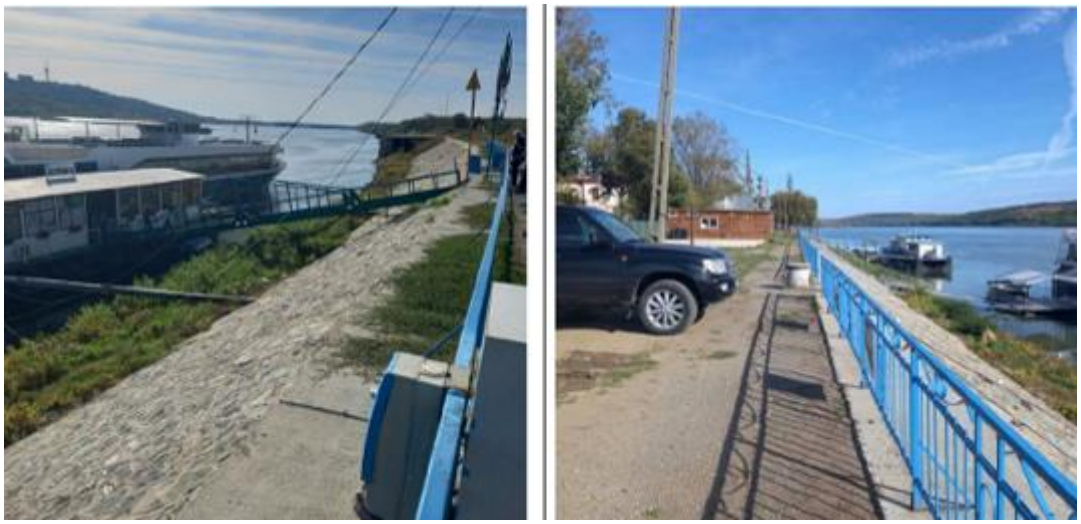


Figure no 1 *(Indication of the area under review*) shows the proposed works for the river control works on the two watercourses, the Argeș and the Dâmbovița rivers.

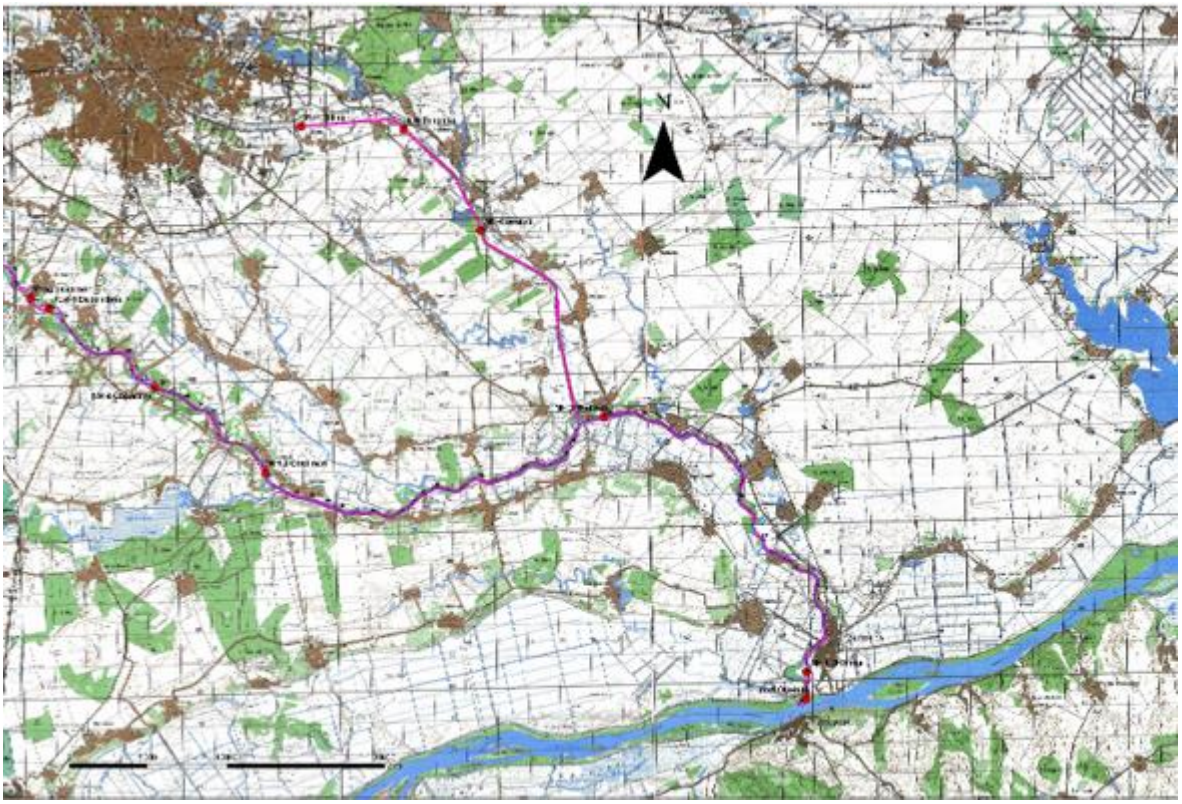


Figure no. 1 - Indication of the area under review

The field visit showed extensive areas with abundant vegetation, slope protection affected by erosion at the base, erosion in the bed of the Argeș River, especially in the area of the diversions from the nodes, ad-hoc rubbish dumps in the Bucharest port area, works degraded by destruction, pits left after uncontrolled ballast excavations both in the riverbed and in the riparian area of the works, especially on the Argeș river, impassable access roads in certain areas.

The resumption and completion of the Argeș and Dâmbovița river control works is needed mainly for the following major reasons:

- the advanced stage of the works carried out, the need to halt the destruction of the works due to vandalization and the growth for over 30 years of shrub and tree vegetation;
- removing the danger of blocking and destroying an investment effort totalling more than €2.7 billion, excluding VAT, carried out before 1990 and now virtually abandoned;
- the major importance of the economic and social benefits generated by the waterway.

The realisation and exploitation of the waterway, through the uses provided, will lead to the implementation of economic and social objectives, which will generate important benefits, such as:

- ***navigation*** - linking Bucharest with the Danube ensures direct access to the port of Constanța, to the main cities along the Danube, as well as to the European inland waterway network;
- ***flood defence*** - for 11 localities, 9,800 households, approx. 50.000 ha of land, 378 km of roads, 5 km of railway and 126 socio-economic objectives.
- ***water supply and irrigation*** - to neighbouring localities, irrigation of approx. 50 thousand ha., dewatering of approx. 30 thousand ha, production of electricity - 126 GWh/year, as well as fish farms on 1,250 ha;
- ***social benefits*** - by providing conditions in the area for: the development of related objectives and activities, the creation of logistic zones and industrial parks, the increase of the economic potential of the neighbouring localities, including job creation and the absorption of unemployment.

The social importance of the project in the region is also evident through the creation of new jobs,

21,600 jobs during the construction period and 520 jobs during the operation period.

2.2 Project location

The location of the works is on Argeș river downstream of the Mihăilești - Cornetu lake and on the Dâmbovița river downstream of the bridge over the Bucharest ring road, in the counties of Ilfov, Giurgiu and Călărași (fig. 2).

The navigable waterway - has a length of 73 km on the Argeș river and takes up a difference in level of 53 m through 4 hydrotechnical nodes (HNs), and on the Dâmbovița river a length of 31 km with a difference in level of 14.60 m, taken up by 2 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and 40.0 m on the Dâmbovița river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.



Figure no. 2 - Location of the project and neighbouring counties

On the territory of Ilfov County, 8 TAUs are crossed by the works: Vidra, 1 Decembrie, Copăceni, Dărăști, Măgurele, Cornetu, Cernica and Glina.

On the territory of Călărași county, 13 TAUs are crossed by the works: Budești, Chirnogi, Crivăț, Curcani, Frumușani, Fundeni, Gălbinași, Mitreni, Oltenița, Plătărești, Radovanu, Șoldanu, Vasilați.

On the territory of Giurgiu county, 9 TAUs are crossed by the works: Adunații Copăceni, Colibași, Comana, Gostinari, Isvoarele, Herăști, Hotarele, Mihăilești, Valea Dragului.

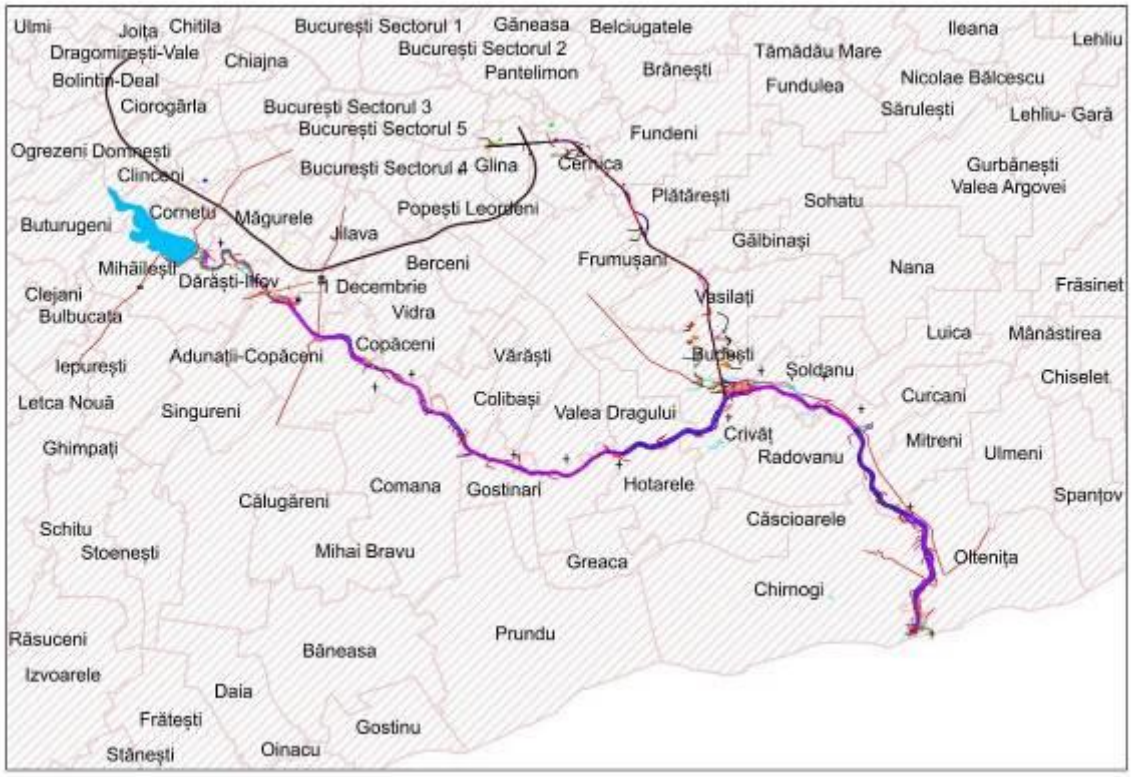


Figure no. 3 - Location of the project and of the TAUs

The site under review is delimited at (Fig. 3):

- North by Ilfov county;
- South by Giurgiu county;
- East by Călărași county;
- West by Giurgiu county.

In terms of location in relation to surface and underground water bodies, the location of the works is on the Argeș river downstream of the Mihăilești - Cornetu lake and on the Dâmbovița river downstream of the bridge over the Bucharest ring road, in the counties of Ilfov, Giurgiu and Călărași;

The navigable waterway - has a length of 73 km on the Argeș river and takes up a difference in level of 53 m through 4 hydrotechnical nodes (HNs), and on the Dâmbovița river a length of 31 km with a difference in level of 14.60 m, taken up by 2 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and 40.0 m on the Dâmbovița river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.

At present, the land related to the objective is located mainly on the public domain of the State and partly on the private domain of the residents.

2.2.1. Tenure arrangement

The following urbanism certificates were issued for this project:

- Urbanism Certificate No. 132 of 24 May 2023 issued by Giurgiu County Council
- Urbanism Certificate No. 54/7737 of 08 June 2023 issued by Ilfov County Council
- Urbanism Certificate No. 29 of 16 May 2023 issued by Călărași County Council.

According to the Urbanism Certificate No. 132 of 24 May 2023 issued by Giurgiu County Council, the current use of the land in question is: River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses. Occupied land - estimated expropriations Giurgiu County - agricultural

land on the Argeș river - 25.59 ha, forest land - 39.80 ha, land with buildings and adjoining areas - 0.48 ha, unproductive land - 62.13 ha (total 128.00 ha).

According to the same Urbanism Certificate No. 132 of 24 May 2023 issued by Giurgiu County Council, the land containing the plots of land outside the built-up area located in the TAUs of Mihăilești, Adunații Copăceni, Comana, Colibași, Gostinari, Izvoarele, Herăști, Hotarele, partially public domain, occupied by the complex control works to be developed on the Argeș river and expropriated pursuant to Article 4 of Decree No 242/1986 and Article 1 of Law No 255/2010, as subsequently amended and supplemented, and land in the private domain of natural and/or legal persons in the agricultural, forestry, construction and non-productive use categories outside the dams, land to be expropriated for the investment: "*River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses*". The land related to the investment is partially located in the protection zone of the Comana Natural Park, the Site of Community Importance *"Comana" - ROSCI0043* and the Special Protection Area for birds "*Comana" - ROSPA0022*.

According to the Urbanism Certificate No. 29 of 16 May 2023 issued by the Călărași County Council, the land in question is located within the built-up area and/or outside the built-up area of Budești, Chirnogi, Crivăț, Curcani, Frumușani, Fundeni, Gălbinași, Mitreni, Oltenița, Plătărești, Radovanu, Șoldanu, Vasilați, Călărași County, according to the General Plan and the related Local Urbanism Regulations approved by the local councils' decisions and is of the public domain of the state and/or of the local administrative units and/or privately owned by individuals and/or legal entities. The land is located in protected areas of archaeological sites or on the list of historical monuments and in areas with partial conditional prohibition of construction, since it is a partially floodable area (outside the built-up area of Curcani commune).

According to the Urbanism Certificate No. 54/7737 of 08 June 2023 issued by the Ilfov County Council, the land falls into the category of use of non-productive land, arable land, buildings and adjoining areas, roads, forest, Argeș and Dâmbovița river basin.

According to the Urbanism Certificate No. 54/7737 of 08 June 2023 issued by the Ilfov County Council, the site is located inside and outside the built-up area of the city of Măgurele and the communes of Vidra, 1 Decembrie, Copăceni, Dărăști-Ilfov, Cornetu, Cernica and Glina, according to the related General Planning Schemes. The land necessary for the control works on the Argeș and Dâmbovița rivers for navigation (a total area of about 42 ha in Ilfov County, as mentioned in the application for the issuance of the urbanism certificate) is part of the public domain of the Romanian State, managed by the National Administration "Apele Romane" (Argeș and Dâmbovița basins), as well as privately owned (individuals and legal entities). The Handover Protocol concluded for the objective "River control works on the Argeș River for flood defence, irrigation and other uses" as well as for some state-owned public property assets under the administration of the Ministry of Environment and Sustainable Development - NA "Apele Romane" under the administration of the Ministry of Transport, through the Compania Naţională Administraţia Canalelor Navigabile S.A. Constanta, for the construction of a navigable waterway from Bucharest to the Danube, concluded in 2008, is presented. The site is not included in the list of historical monuments approved by the Order of the Minister of Culture No. 2828/2015. However, it is partially in the protection zone of some archaeological sites, namely in the archaeological protection zone along the Argeș river; it is affected by the water protection zone, the protection zone of an overhead power line, forest area, canals of the Land Reclamation Agency, the railway protection and safety zone (according to the regulation plans under the General Planning Scheme), the radial road 8 - Splai Expres.

2.2.2. Distances to borders

The site of the works is located on the Argeș river downstream of the Mihăilești - Cornetu lake on the territory of the counties of Ilfov, Giurgiu and Călărași.

Waterway - 73 km long on the Argeș river and takes up a level difference of 53 m through 4 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.

At present, the land related to the objective is located mainly on the public domain of the State and partly on the private domain of the residents.

The location of the proposed works is 4 km from the southern border with Bulgaria, 424 km from the western border with Hungary, 264 km from the southern border with Serbia, 376 km from the northern border with Ukraine and 168 km from the Republic of Moldova.

The works proposed to be carried out under this project will not affect the water quality of the water body shared with the Bulgarian area (Danube River) which could create a potential transboundary impact, due to the distance of 680 m, the works are carried out step by step, are of short duration and only foresee a boundary area near the shore for the development of the hydrotechnical node HN1 Oltenița and water control works for the port of Oltenița - as described in the previous chapters).

In order to ensure access to the berths in all levelling situations on the Danube, the initial project envisaged excavations and dredging to ensure the bottom elevation at +6.50 mrMB in the aquatory, between the right bank waiting areas, the operational berths and the left bank waiting areas. At the moment in the area of the port of Oltenița there are still 650 thousand cubic metres of dredging works to be carried out.

The dredging works are carried out periodically in order to ensure navigation so that the impact during the execution period of the works will not be greater than that expected during normal periods of operation of the port (either the Romanian or the neighbouring country - Bulgaria).

In addition, the works carried out, the traffic in the Oltenița port area will not generate a significant increase in NOx emissions which would affect the neighbouring area. In addition, the fact that the distance of 680 m from the works area to the neighbouring shore significantly reduces the concentrations of NOx emissions, the impact of the proposed works will have a negligible negative impact on the neighbouring area - Bulgaria and the population of the inhabited area of the Bulgarian town of Turtucaia will not be affected.

2.2.3. Project location in relation to protected natural areas of Community importance

The distances to the relevant protected natural areas of Community importance (PNACIs) in the vicinity of the project are shown in Table 1 and Figure 4.

Table No. 1 - Distances from PNACI in the project vicinity

No.	PNACI name	Location of the project in relation to PNACIs
1.	ROSAC0043 Comana	Inside the PNACI
2.	ROSPA0022 Comana	Inside the PNACI
3.	ROSPA0038 Danube-Oltenița	Inside the PNACI
4.	ROSCI0308 Cernica Lake and Forest	Approximately 1,332 m away from the nearest damming works at km 27+000 on the left bank of the Dâmbovița river
5.	ROSPA0122 Cernica Lake and Forest	Approximately 1.332 m away from the nearest damming works at km 27+000 on the left bank of the Dâmbovița river
6.	ROSAC0131 Oltenița-Mostiștea-Chiciu	Approximately 2.626 m away from the nearest works for railway expansion at km 0+000 from the port of Oltenița, on the left bank of the Argeș river
7.	ROSPA0136 Oltenița - Ulmeni	Approximately 3.824 m away from the nearest works of the collector canal - front drain of the left bank dam at km 6+000 on the Argeș river

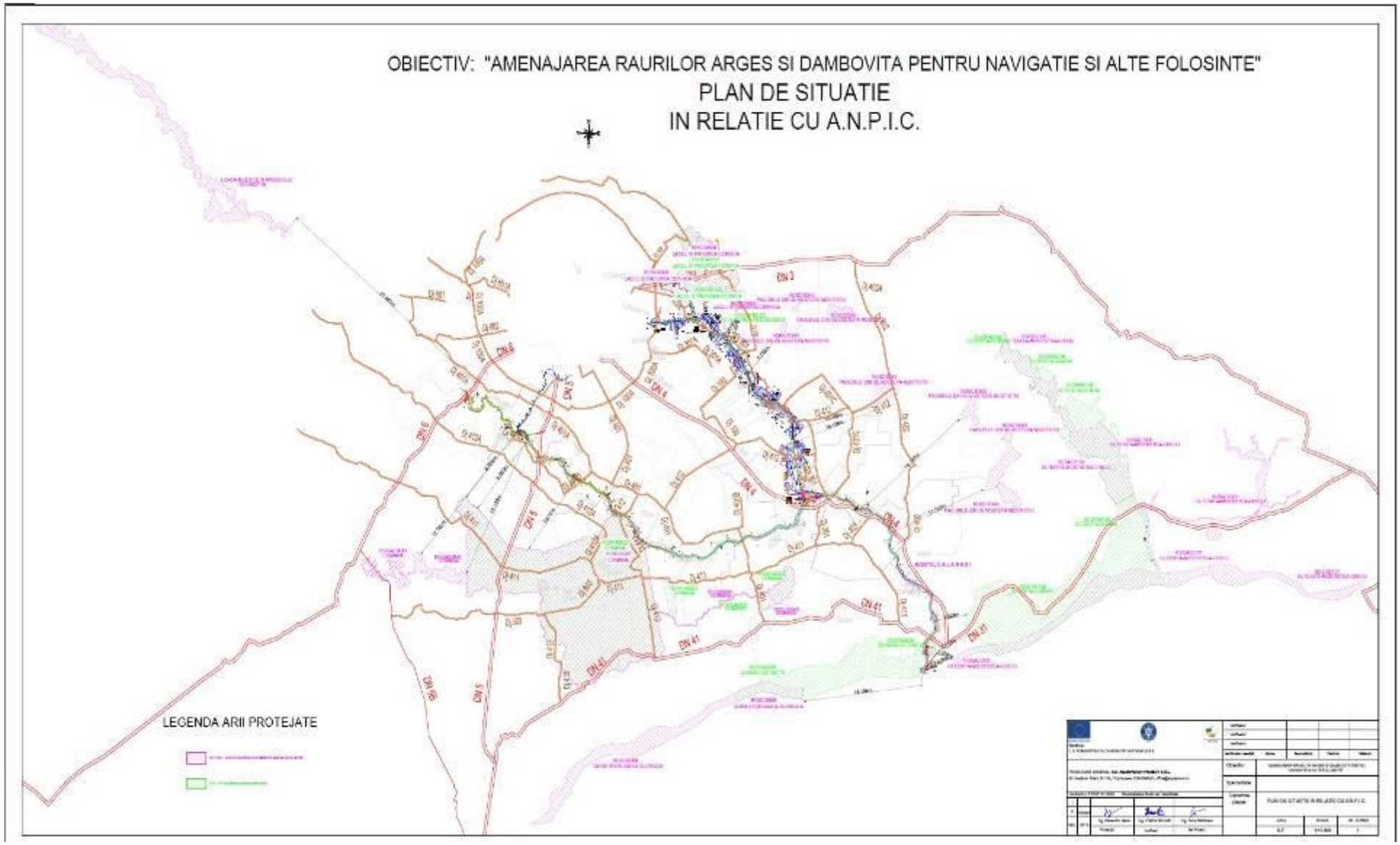


Figure no. 4 - Project location in relation to Natura 2000 sites

2.2.4. Location of the objective in relation to neighbouring uses

The Argeș - Vedea river basin, where the project subject of this report is located, consists of the following basins:

- *Argeș river basin*

It lies between the following geographical coordinates: 43º54'50″ - 45º36'30″ north latitude and 24º30'50″- 26º44'25″ east longitude. It is bordered to the north by the Olt river basin, to the west by the Olt and Vedea river basins, to the south by the Danube river basin and to the east by the Ialomita river basin, with an area of 12,550 km². The 350 km long Argeș river forms upstream of the Vidraru reservoir, under the crest of the Făgăraș Mountains, where the two rivers Capra and Buda originate, which, when joined together, give rise to the Argeș river, which now flows into the Vidraru Lake.

- *Vedea river basin*

It is a component of the Danube basin and situated in the southern part of the country, has an area of 5,430 km² and is bounded on the north-south direction between the parallels of 45º03'20'' and 43º42'13'' north latitude, and on the west-east direction between the meridians of 24º27'26'' and 25º36'56'' east longitude, being limited by the river basins of Olt, Călmățui and Argeș. The Vedea river is 224 km long and rises in the sub-Carpathian area (Cotmeana Plateau) at an altitude of 504 m.

- *Călmățui river basin*

It is bounded by the river basins of Olt (to the west), Vedea (to the east) and the Danube river to the south. It has a smaller surface area of just 1,413 square kilometres. The Călmățui river is 139 km long, is also called the Călmățui of Teleorman or of Burnaș, springs from the Boianului plain in the foothills east of Bărcănești, at an altitude of 157 m and flows into the Suhaia Lake near Viișoara.

The rest of the **catchment** area is represented by a part of the **Danube river basin** (between the confluence with the Olt and the Argeș rivers - 2,086 km²).

The Argeș - Vedea hydrographic area has a complex system of hydrotechnical works for the quantitative management of water resources, including several reservoirs with complex uses: flood defence, water supply for the population, industry, irrigation, energy production, etc., as well as branches for transiting volumes of water from one watercourse to another, which can be used during periods of high water to transit/reduce a volume of water from one watercourse to another and during periods of drought when it is necessary to supplement a volume of water on small watercourses requiring a higher flow.

The water control works of the Argeș river basin was designed in such a way as to ensure flood defence of the main localities/municipalities in the Argeș Vedea river basin: Câmpulung, Curtea de Argeș, Pitesti - Argeș county and last but not least - Bucharest municipality with over 2.215.000 inhabitants, of which about 1,900,000 in the capital.

The project works are also correlated with the following measures of the Flood Risk Management Plan (FRMP) (as mentioned in the water body impact assessment study) (Fig. 5):

- Complex river control works on the Dâmbovița river for flood defence of Bucharest municipality
- Complex development of the Argeș, Târgului and Doamnei rivers to protect the riverside localities against flooding
- Complex development of the rivers Dâmbovița, Ilfov and Colentina for flood defence of the riverside localities.

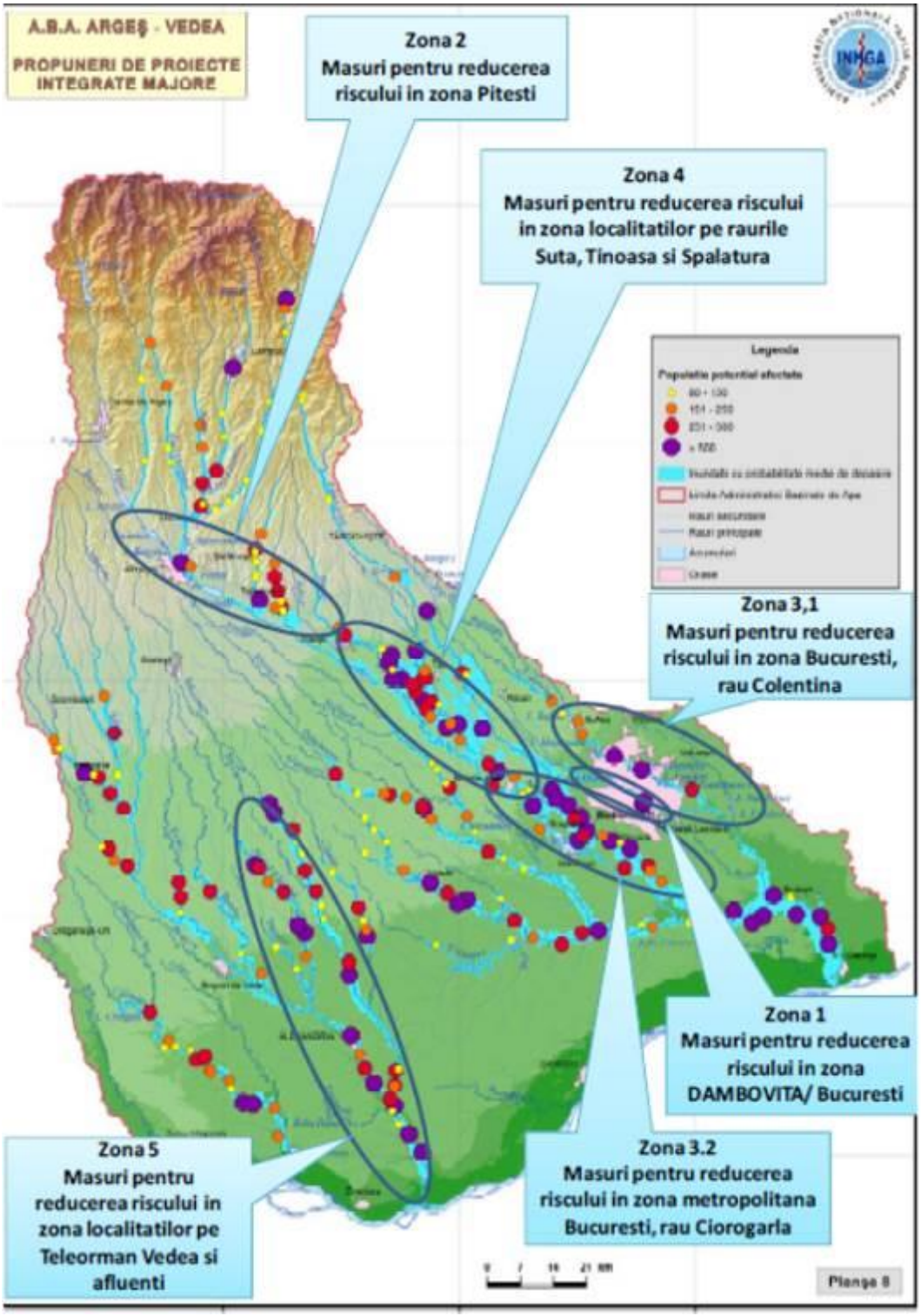


Figure no. 5 - Measures under the FRMP[1]

2.2.4.1 Description of project status

❖ **Indication of proposed works for the water body**

RORW10-1-25_B8 - Dâmbovița: downstream of the Lacul Morii reservoir - control works for discharge of Apa Nova (Glina)

[1] Source: Impact Assessment Study on water bodies (SEICA)

- Port of Bucharest - Glina
- Realisation of the fairway over a length of 1.1 km of the 17 km water body with a minimum width at the base of 36 m.

RORW10-1-25_B9 - Dâmbovița: upstream of the discharge Apa Nova (Glina) - conf. Argeș

- Hydrotechnical Node 1 - Cucuieți
- Hydrotechnical Node 2 - Tânganu
- Realisation of the fairway over a length of 29.9 km of the 31 km water body with a minimum width at the base of 36 m
- New bridge over the national road DN 4 Bucharest - Oltenița (L = 630m)
- New bridge over the county road DJ 412 that connects the localities of Nuci and Vasilați, at approx. 250 m downstream from the existing one (L = 479.70 m)
- New bridge over the Dâmbovița river at approx. 25 m downstream from the existing bridge, over the county road DJ100 Fundeni - Pițigaia (L = 319.50 m).

RORW10-1_B7 - Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the Danube

- Port of Oltenița
- Hydrotechnical Node 1 - Oltenița
- Hydrotechnical Node 2 - Budești
- Realisation of the fairway over a length of 27.2 km of the 30 km water body with a minimum width at the base of 36 m
- Rehabilitation of the bridge over National Road DN41 (L = 292 m)
- Rehabilitation of the bridge over County Road DJ301 between Budești and Crivăț (L = 319.50 m).

RORW10-1_B6 - Argeș: section downstream of the Mihăilești reservoir - upstream of the confluence with the Dâmbovița river

- Port of Bucharest - 1 Decembrie
- Hydrotechnical Node 3 - Gostinari
- Hydrotechnical Node 4 - Copăceni
- Realisation of the fairway over a length of 46 km of the 57 km water body with a minimum width at the base of 36 m
- Rehabilitation of the bridge over National Road DJ401 (L = 209.50 m)
- Rehabilitation of the bridge over National Road DJ412 (L = 257m).

Lengths and surfaces of water bodies RORW10-1-25_B8: Dâmbovița: downstream of Lacul Morii reservoir - control works for the discharge of Apa Nova (Glina), RORW10-1-25_B9: Dâmbovița: upstream of the discharge Apa Nova (Glina) - conf. Argeș, RORW10-1_B7: Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the Danube, RORW10-1_B6: Argeș: section downstream of Mihăilești reservoir - upstream of the confluence with the Dâmbovița river where the work is proposed are presented in Table 2 and 3.

Table no. 2 - Length/area of surface water body potentially affected by project implementation

Water body name	Water body category	Length (km)	Area (m2)
Dâmbovița: downstream of Lacul Morii reservoir - upstream of the discharge Apa Nova (Glina)	RW	17	17
Dâmbovița: upstream of the discharge Apa Nova (Glina) - conf. Argeș	RW	31	32
Argeș: section upstream of the	RW	30	30

confluence with the Dâmbovița river - confluence with the Danube			
Argeș: section downstream of Mihăilești reservoir - upstream of the confluence with the Dâmbovița river	RW	57	57

Legend:
RW = River water body

Table 3 - Surface area of groundwater body

Water body name	Surface (km^2)
ROAG03 - Colentina	1.868
ROAG05 - Argeș river meadow and terraces	1.904
ROAG11 - Bucharest - Slobozia	7.204
ROAG12 - Eastern Wallachian Depression	44.093

❖ **Main characteristics of the planned river control works on the Argeș river**

The documentation drawn up and the works carried out between 1986 and 1990 (1994) concerned the lower course of the Argeș River in the section between the railway bridge over the Bucharest - Craiova railway line and the Danube, in a length of approx. 95 km.

Starting from the Danube, the course of the Argeș river was to be navigable up to the port of Bucharest - 1 Decembrie, over a length of approx. 73 kilometres. Further upstream, it was planned to embank the river up to the dam of the lake of Mihăilești - Cornetu, on a length of approx. 10 km, thus ensuring the protection of neighbouring localities and land from flooding. Behind this dam, a reservoir was planned and realised, which is approx. 11.8 km long, up to the railway bridge at Grădinari.

The reservoir of Mihăilești - Cornetu was completed, with reduced parameters compared to the initial documentation, and is currently exploited by the Romanian Waters Administration - Argeș - Vedea Water Management Directorate.

The present documentation considers the course of the Argeș River on the section between the Danube (km 0+000) and the dam of Mihăilești - Cornetu lake (km 83+041), with the port of Bucharest being located at km 73+000. The connection of the sector developed for navigation with the bed of the natural - dammed course of the river was made by a bottom sill located at km 73+465.

The control works on the lower course of the Argeş River for navigation consist of levelling the river in plane in order to allow the access of convoys formed by a barge and the corresponding pusher, as well as its levelling and its sectioning by 4 steps that take over the difference in level of about 53 m between the Argeș water level in the area of the port of Bucharest and the confluence with the Danube.

Each step forms a hydrotechnical node composed of the following construction works:

- Concrete weir for high-volume water discharge;
- Hydroelectric power plant;
- Locks.

❖ **Characteristics of the fairway**

- length of navigable waterway between the Danube and the Port of Bucharest - 1 Decembrie 73 km
- minimum width at the base of the fairway section, set to allow flood wave transit 80 metres
- minimum water depth 4.5 m
- minimum radius
  - normal 1000 m

- exceptional 750 m

– air clearance above water level at the normal retention level (NRL) 11.0 m.

❖ **Hydrotechnical Nodes on the Argeș River**

A total of four hydrotechnical nodes have been designed along the Argeș River: HN1 Oltenița, HN2 Budești, HN3 Colibași (Gostinari), HN4 Copăceni (Varlaam).

Hydrotechnical nodes are equipped with:

- wasteway with 3 surface spillways at HN 1 and HN 2 and 2 spillways at HN 3 and HN 4 and bottom discharge conduits;
- twinned locks that ensure the transit of ships from one reach to another;
- power plant for processing available hydropower potential.

Wasteways are equipped with segment flap gates, measuring 10 x 5.75 m, (1.25 m flap height), as well as 2 bottom discharge conduits. At HN 1 and HN 2, the bottom discharge conduit valves are 5.50 x 3.30 m, and at HN 3 and HN 4, the valves are 4.50 x 3.0 m.

The dimensions of the locks are set in accordance with the dimensions of the 2000 tonne barge designed convoy, namely:

- net length of the lock chamber 130 m
- net width 2.50 m
- depth on sill 4.75 m.

When flows on the Argeș River exceed 500 m3/s, navigation ceases and the locks are used to evacuate the water inrush.

The dam steps at the 4 hydrotechnical nodes on the navigable sector have a drop, at a normal retention level, of 13 metres. They have a similar composition, with large wasteways, hydroelectric power plants and locks.

The waiting ports at the locks are 90 m wide, the length of the mooring structures is 130 m and the length of the routing structures is 120 m.

Wasteways have openings of 10 m. At the hydrotechnical nodes HN1 and HN2, after the Argeș receives as tributaries the rivers Neajlov, Sabar and Dâmbovița, they have 3 openings each, and at the nodes HN3 and HN4, located upstream of these tributaries, 2 openings each. Wasteways are fitted with identical hydromechanical equipment.

The hydropower plants are located in the 4 hydrotechnical nodes, between wasteways and locks and have an installed capacity of 4 x 5.70 MW = 22.80 MW. They ensure an energy production of 58.20 GWh/year in years with average rainfall.

The locks are twinned. They are identical and sized in accordance with the size of the designed convoy, namely:

- net length of the lock chamber 130.00 m;
- total length 177.00 m;
- net width of the lock chamber 12.50 m;
- minimum water depth at the sill of the lock 4.75 m.

Outports of locks were made of prefabricated reinforced concrete spatial elements founded on drilled columns.

❖ **Solutions adopted for the river control works carried out on the Argeș river**

Navigational improvements consist of regularising the course of the river in plane, diking and damming it and sectioning it by means of steps (hydrotechnical nodes).

Upstream of the port of Bucharest - 1 Decembrie, a bottom sill has been planned at km 73+465,

linking the navigable sector with the upstream dammed area. On this sector the thalweg is maintained at the current level up to the dam of the Mihăilești - Cornetu reservoir (km 83+043).

The route of the planned fairway on the Argeș river was established taking into account the requirements of PIANC WG 20-2006. The minimum alignment between curves was intended to be greater than 214 m - in the case of curves in the same direction and greater than 320 m in the case of curves in the opposite direction. This ensures normal, unrestricted manoeuvrability of the designed convoy.

❖ **Longitudinal profile**

For the Argeș river, a large number of studies have been carried out on the number of dam steps and the fall head at each step and their location. The studies showed that it was appropriate to create 4 dam steps on the navigable section of the river with a fall head of 13.0 m at the normal retention level.

Dam steps are designed in the form of hydrotechnical nodes located as follows:

- hydrotechnical node HN 1 of Oltenița - ensures the linking to the Danube levels
- hydrotechnical node HN 2 of Budești - immediately upstream of the current confluence Dâmbovița - Argeș;
- hydrotechnical node HN 3 of Colibași - upstream the confluence Neajlov - Argeș;
- hydrotechnical node HN 4 of Copăceni/Varlam.

The hydrotechnical nodes together with the bottom sill at km 73+465 delimit a number of 5 reaches on the lower course of the Argeș. The five reaches of the planned control works on the Argeș River are delimited according to the following table:

CANAL POND	Sector	Km
Reach "0" (between the Danube and HN1 Oltenița)	navigable	0+000 ÷ 2+282
Reach 1 (between HN1 of Oltenița and HN2 of Budești)		2+282 ÷ 28+351
Reach 2 (between HN2 of Budești and HN3 of Colibași)		28+351 ÷ 53+475
Reach 3 (between HN3 of Colibași and HN4 of Copăceni(Varlam)		53+475 ÷ 63+000
Reach 4 (between HN4 of Copăceni Varlam and bottom sill)		63+000 ÷ 73+289
Reach 5 (between the bottom sill and the Mihăilești dam)	controlled	73+289 ÷ 82+918

The length of each reach, taking into account the works related to the hydrotechnical nodes, is given in the following table:

CANAL POND	Sector	Length in m
Reach "0" (between the Danube and HN1 Oltenița)	navigable	2097
Reach 1 (between HN1 of Oltenița and HN2 of Budești)		25869
Reach 2 (between HN2 of Budești and HN3 of Colibași)		24939
Reach 3 (between HN3 of Colibași and HN4 of Copăceni(Varlam)		9340
Reach 4 (between HN4 of Copăceni Varlam and bottom sill)	navigable	10274
Total length of the navigable sector (including hydrotechnical nodes)		73289
Reach 5 (between the bottom sill and the Mihăilești dam)	controlled	9629
Total length of the controlled sector (Mihăilești dam - bottom sill)		9629
TOTAL LENGTH OF CONTROL WORKS ON ARGEȘ RIVER		**82918**

On the Dâmbovița River, downstream of the capital's ring road, the river's course will be, according to

the project, improved for navigation up to the confluence with the Argeș river at Budești, for about 30.5 km.

The hydrotechnical scheme of the waterway on the Argeș river includes the realisation of 4 dam steps to take up the difference between the average water level in the area of the port of 1 Decembrie and that of the Danube at Oltenița, as can be seen in Figures 6 and 7.

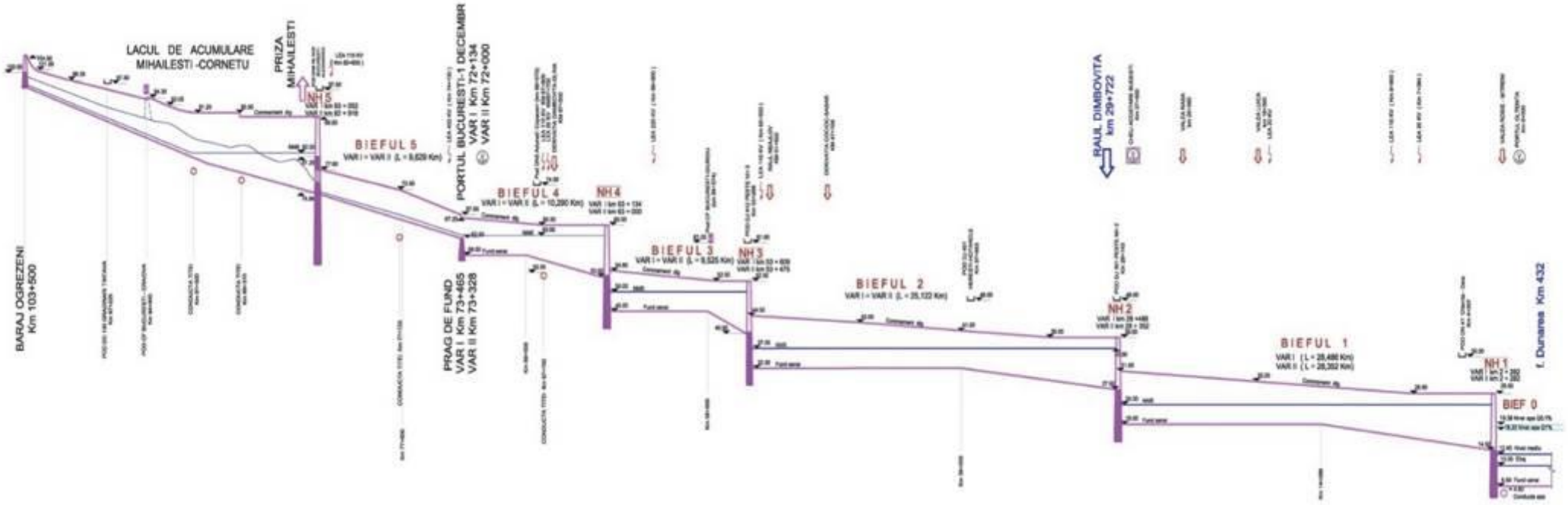


Figure no. 6 - Longitudinal profile of the Argeș river control works

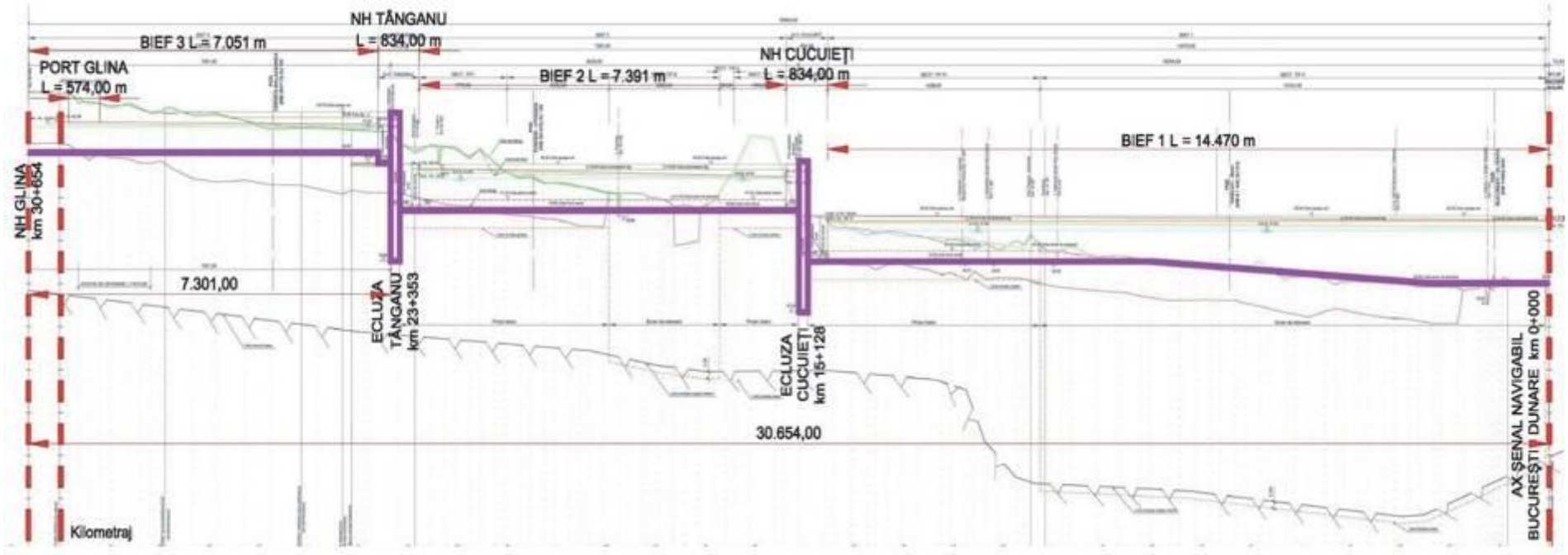


Figure no. 7 - Longitudinal profile of the Dâmbovița river control works

2.2.4.2 Description of uses in the vicinity of the project

The route of the improvements on the lower course of the Argeș and Dâmbovița rivers is shown in Figure 8.

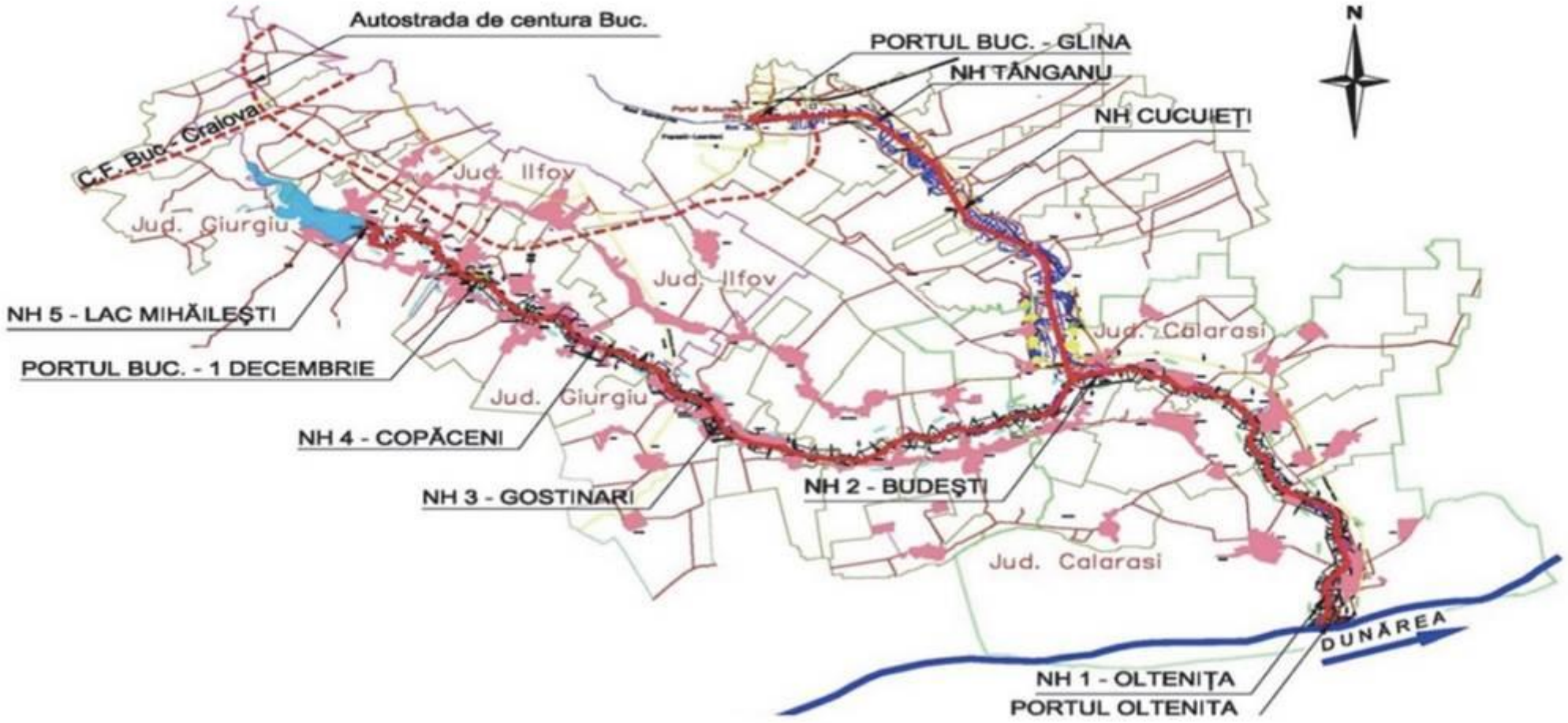


Figure no. 8 - River control works on Argeș and Dâmbovița rivers

Annex 4 of this report details the control works/uses in the vicinity of the project site.

2.2.5. Project location in relation to inhabited areas, historical monuments, UNESCO sites

As specified above, the project crosses the area of three counties, namely: Ilfov, Călărași and Giurgiu as well as a number of TAUs in each county, as follows:

- On the territory of Ilfov County, 8 TAUs are crossed by the works: Vidra, 1 Decembrie, Copăceni, Dărăști, Măgurele, Cornetu, Cernica and Glina.
- On the territory of Călărași county, 13 TAUs are crossed by the works: Budești, Chirnogi, Crivăț, Curcani, Frumușani, Fundeni, Gălbinași, Mitreni, Oltenița, Plătărești, Radovanu, Șoldanu, Vasilați.
- On the territory of Giurgiu county, 9 TAUs are crossed by the works: Adunații Copăceni, Colibași, Comana, Gostinari, Isvoarele, Herăști, Hotarele, Mihăilești, Valea Dragului.

Based on the data provided by the National Archaeological Repertory, List of Monuments in Giurgiu, Călărași and Ilfov counties, 78 perimeters of archaeological interest (Pl.I) were delimited, 44 archaeological sites were delimited along the Dâmbovița river, and 34 sites were delimited along the Argeș river

In order to establish the documentary diagnosis, all available information sources were consulted[2].

The archaeological diagnostic survey covered the portion of the Argeș river between the Mihăilești Cornetu lake and the Danube, and on the Dâmbovița river between Glina and Budești. The survey covered both meadows and high terraces on both sides of the rivers. Most recorded archaeological sites are listed in the National Archaeological Repertory (NAR). Research and content analysis of the National Archaeological Repertory of Romania.

The following archaeological sites have been recorded as a result of the documentary diagnosis, which will be verified in the field, delimited and recorded as such in the second stage of the survey.

❖ ***On the Dâmbovița river, from upstream to downstream:***

1. Glina, TAU Glina, Ilfov County, Bronze Age settlement (Glina culture), Early Medieval settlement (Dridu culture), Late Medieval settlement, NAR code: 179356.07
2. Glina, TAU Glina, Ilfov County, Bronze Age settlement (Glina culture), Early Medieval settlement (Dridu culture), Late Medieval settlement, NAR code: 179356.06
3. Bălăcenca,TAU Bălăceanca, Ilfov County, "The tell of Glina, NAR code: 101760.02, LHM code 2015: IF-I-s-A-15146. Neolithic settlement (Boian culture), Eneolithic settlement (Gumelnița culture), Bronze Age settlement (Glina culture)
4. Bălăceanca, TAU Bălăceanca, Ilfov County, Neolithic (Boian culture) settlement, Eneolithic (Gumelnița culture), Late La Tène, Early Medieval settlement, NAR code: 101760.04, LHM code 2015: IF-I-s-A-15147
5. Bălăceanca, TAU Bălăceanca, "Ecluză" site, a complex of settlements from the Geto-Dacian and medieval times, NAR code: 101760.03, LHM code 2015: IF-I-s-A-15148
6. Bălăceanca, Ilfov County, "Sand Quarry"; Migration Age settlement (Sântana de Mureș-Cerneahov culture), NAR code: 101760.08, LHM code 2015: IF-I-s-A-15147.11
7. Bălăceanca, Ilfov County, Neolithic settlement, NAR code: 101760.05

[2] - Consultation of specialised bibliographies
- Survey of the archaeological material existing in the store rooms and showcases of the Olteniţa Museum of Gumelniţa Civilisation and the Bucharest Municipality Museum;
- Studying of the National Archaeological Repertory;
- Studying the List of Historical Monuments (LHM) in Giurgiu, Călărași and Ilfov counties

8. Poșta, TAU Cernica, Ilfov county, La Tène settlement, migrations, Late Medieval settlement, NAR code: 101788.02, LHM code 2015: IF-I-s-B-20259
9. Poșta, TAU Cernica, Ilfov county, "Valea secată" La Tène Getic settlement, Migration Age settlement, Early Medieval settlement, NAR code: 101788.03, LHM code 2015: IF-I-s-B-20259.09-
10. Poșta, TAU Cernica, Ilfov County, Neolithic settlement; NAR code: 101788.04, LHM code 2015: IF-I-s-B 20259
11. Poșta, TAU Cernica, Ilfov county, Bronze Age settlement, La Tène, Migration Age, Early Medieval Age, NAR code: 101788.01, LHM code 2015: IF-I-s-B-20259,
12. Pițigaia, TAU Frumușani, Călărași county, Bronze Age settlement (Glina culture) Pițigaia II;
13. Pițigaia, TAU Frumușani, Călărași county, Bronze Age settlement (Glina culture) Pițigaia I;
14. Pițigaia, TAU Frumușani, Călărași County, Bronze Age settlement (Glina culture) Pițigaia III; NAR code: 102990.04
15. Fundeni, Fundeni TAU, Călărași county, "Sf. Apostol Andrei" church; NAR code: 103023.01, LHM code 2015: CL-II-a-A-14688
16. Fundeni, Fundeni TAU, Călărași county, Bronze Age settlement, Tei culture, La Tène Getic settlement, NAR code: 103023.03
17. Pițigaia, TAU Frumușani, Călărași county, Ruins of "Sf. Nicolae" Church of Pițigaia;
18. 19th-century cemetery at Plătărești;
19. Pițigaia, Geto-Dacian settlement at Lake Tătaru, NAR code: 102990.05,
20. Pițigaia, TAU Frumușani, Călărași county, Prehistoric settlement at Tătaru lake; NAR code:102990.06
21. Pițigaia, TAU Frumușani, Călărași County, Bronze Age settlement at Casa parăsită;
22. Cucuieți, TAU Plătărești, Călărași county, "Sf. Vasile cel Mare" Church;
23. Cucuieți, Plătărești, Călărași county. Medieval settlement of Măgura Cucuieți, NAR code: 104653.02
24. Gălbinași, TAU Gălbinași, Călărași county, "Sf. Împăraţi Constantin și Elena" Church; NAR code: 105847.06, LHM code 2015: CL-II-m-B-14689
25. Gălbinași, TAU Gălbinași, Călărași county, La Tène Getic settlement, migrations age, Santana de Mures culture, early medieval Dridu culture;
26. NAR code: 105847.01
27. Gălbinași, TAU Gălbinași, Călărași county, La Tène Getic settlement, migrations age, Santana de Mures culture, early medieval Dridu culture; NAR code: 105847.03
28. Gălbinași, TAU Gălbinași, Călărași county, Geto-Dacian settlement
29. Gălbinași, TAU Gălbinași, Călărași county, Multilayered settlement, Bronze Age, Early Middle Ages, NAR code: 105847.05
30. Popești, TAU Vasilați, Călărași county, Cioarin Forest multilayered settlement,
31. bronze Age, Getic La Tène, Middle Ages, NAR code: 105865.02, LHM code 2015: CL-I-m-A-14568
32. Popeşti, Multilayered site, Neolithic necropolis, Boian culture, Bronze Age settlement, Migration Age, Medieval Age, NAR code: 105865.01, LHM code 2015: CL-I-s-A-14567
33. Vasilați, TAU Vasilați, Călărași County, Sântana de Mureș Cerneahov settlement, NAR code: 105838.03
34. Vasilați, TAU Vasilați, Călărași county, Vasilați - Moș Neagu multilayered settlement, Neolithic settlement - Dudești culture, La Tène Getic settlement, NAR code: 105838.01, LHM code 2015: CL-I-s-B-14588
35. Vasilați, TAU Vasilați, Călărași county, Tell-like settlement, Boian culture; NAR code: 105838.04
36. Nuci, TAU Vasilați, Călărași county, Palanca I, Bronze Age settlement, Glina culture and Tei culture, La Tène Getic settlement, NAR code: 105856.01, LHM code 2015: CL-I-s-B-14562

37. Nuci, TAU Vasilați, Călărași county, Palanca II, Eneolithic settlement of the Boian and Gumelnita cultures, Bronze Age settlement of the Glina and Tei cultures, fortified Getic settlement; NAR code:105856.02
38. Buciumeni, TAU Budești, Călărași county, Bronze Age settlement of Gura Cânlăului; NAR code: 101485.01
39. Buciumeni, Budești, Călărași county, Medieval Siliștea no. 1; NAR code: 101485.02
40. Buciumeni, Medieval Siliștea no. 2; NAR code: 101485.03
41. Budești, TAU Budești, Călărași county, Măgura Bivolu, Eneolithic settlement, Gumelnița culture, NAR code: 101467.02
42. Budești, TAU Budești, Călărași county, Bivolu point, Multilayered settlement. Neo-Eneolithic settlement of the Boian and Gumelnița cultures, Bronze Age settlement of the Tei culture, Hallstatt-period settlement of the Basarabi culture, La Tène Getic settlement; NAR code: 101467.06
43. Budești, TAU Budești, Călărași county, Prehistoric settlement; NAR code: 101467.03
44. Budești, TAU Budești, Călărași county, Bronze Age settlement, La Tène Getic settlement; NAR code: 101467.04
45. Budești, TAU Budești, Călărași county, upstream 500 m from Ciocârla, Bronze Age settlement of the Tei culture; NAR code: 101467.05
46. Budești, TAU Budești, Călărași county, "Ciocârla" point, Bronze Age settlement, Tei, Radovanu cultures, medieval necropolis, NAR code: 101467.01, LHM code 2015: CL-I-s-B-14529

❖ ***<u>On the Argeș river downstream of Mihăileşti-Cornetu lake</u>***

47. Mihailești, TAU Mihailești, Giurgiu county, Bronze Age settlement - Glina and Tei cultures, Hallstattian settlement - Basarabi culture, La Tène Getic settlement, Medieval settlement; NAR code:104145.01, LHM code 2015: GR-I-s-B-14805
48. Adunații Copăceni - La pod, Adunații Copăceni,. Giurgiu county, Multilayered site. Bronze Age settlement - Tei culture, La Tène Getic settlement, Migration Age settlement - Santana de Mureș Cerneahov culture, Medieval settlement - early culture Dridu; NAR code:100790.05
49. Adunații Copăceni-Dăneasca, TAU Adunații Copăceni, Giurgiu county, Bronze Age settlement - Glina and Tei cultures, La Tène Getic settlement; NAR code: 100790.01, LHM code 2015: GR-I-s-B-14758
50. Varlaam, TAU Adunații Copăceni, Giurgiu county, Bronze Age settlement - Glina culture, Late Roman settlement; NAR code: 100825.01, LHM code 2015: GR-I-s-B-14835
51. Mogoșești, TAU Adunații Copăceni, Giurgiu county, Bronze Age settlement - Glina and Tei cultures, Hallstattian settlement - Basarabi culture, NAR code: 100816.02,
52. Mironești - La pod, TAU Gostinari, Giurgiu county, Bronze Age settlement, settlement, La Tène Getic settlement, early medieval settlement of the Dridu culture, NAR code: 103390.13
53. Mironești, TAU Gostinari, Giurgiu county, Bronze Age settlement, La Tène Getic settlement; NAR code: 103390.17
54. Mironești - Pe Coastă, TAU Gostinari, Giurgiu county, Bronze Age settlement - Tei culture, La Tène Getic settlement; NAR code: 103390.03, LHM code 2015: GR-I-s-B-14806
55. Mironești, TAU Gostinari, Giurgiu county, "Gostinăreanca" settlement;
56. Mironești, "La Panait", TAU Gostinari, Giurgiu county, Bronze Age settlement, Tei culture; NAR code: 103390.05
57. Mironești, "La Pisc", Bronze Age settlement; NAR code: 103390.06
58. Mironești, The ruins of the court of Radu Șerban, TAU Gostinari, Giurgiu county, La Tène Getic settlement; Late Medieval manor house, NAR code: 103390.08, LHM code 2015: GR-II-a-A-A-15040

59. Mironești, "În Vale", TAU Gostinari, Giurgiu county, Settlement of the Age of Migrations - Sântana de Mureș Cerneahov culture, Early Medieval settlement - Dridu culture; NAR code:103390.02, LHM code 2015: GR-I-s-B-14807
60. Mironești, "Conacul lui Palade", TAU Gostinari, Giurgiu county, Bronze Age settlement, Hallstattian settlement, La Tène Getic settlement, NAR code: 103390.04
61. Mironești, "Malu Roșu", TAU Gostinari, Giurgiu county, Eneolithic settlement - Cernavodă III culture, Bronze Age settlement - Glina and Radovanu cultures, Hallstattian settlement - Basarabi culture, La Tène Getic settlement, Early Medieval settlement - Dridu culture; NAR code: 103390.01, LHM code 2015: GR-I-s-B-14808
62. Mironești, west of Palade's Manor, TAU Gostinari, Giurgiu county, Early Medieval settlement - Dridu culture; NAR code: 103390.12
63. Mironești -The village cemetery, TAU Gostinari, Giurgiu county, Hallstattian and medieval settlement; NAR code: 103390.11
64. Mironești, "Cariera de lut", TAU Gostinari, Giurgiu county, Medieval brick-burning kilns; NAR code: 103390.14
65. Mironești, "Sf. Nicolae" Church, XVII century; TAU Gostinari, NAR code: 103390.15
66. Radovanu Balta Giroaia, TAU Radovanu, Călărași county, Bronze Age settlement - Tei and Radovanu cultures, La Tène Getic settlement, NAR code: 104760.08
67. Radovanu - Jidovescu point, TAU Radovanu, Călărași county, La Tène Getic settlement; NAR code 104760.05, LHM code 2015: CL-I s-B-14574
68. Radovanu, Giroaia Moor, TAU Radovanu, Călărași county, tumulus - Bronze Age; NAR code: 104760.10
69. Radovanu, Baliză point, TAU Radovanu, Călărași county, Neolithic settlement - cultural aspect Dudești; NAR code: 104760.04
70. Radovanu La Grădiște, TAU Radovanu, Călărași county, Dava deal Gorgana II, Bronze Age settlement - Radovan appearance, La Tène Getic fortified settlement, NAR code: 104760.07, LHM code 2015: CL-I-s-B-14572
71. Radovanu, TAU Radovanu, Călărași county, Dava de la Gorgana I; Eneolithic settlement - Cernavoda and Gumelnița cultures, Bronze Age settlement - Coslogeni culture, La Tène Getic fortified settlement, NAR code: 104760.03, LHM code 2015: CL-I-s-B-14572
72. Negoești, TAU Șoldanu, Călărași county, Negoești Monastery; NAR code: 105400.01, LHM code 2015: CL-II-a-A-14694
73. Șoldanu - La pod, TAU Șoldanu, Călărași county, Hallstattian settlement - Basarabi culture, NAR code: 105393.01
74. Valea Popii "Coada Malului", TAU Radovanu, Călărași county, Bronze Age settlement - Tei culture, La Tène Getic settlement, Early Medieval settlement - Dridu culture; NAR code: 104779.01, LHM code 2015: CL-I-m-B-14587.01
75. Curcani, TAU Curcani, Călărași county, Boian settlement of Sălcioara;
76. Clătești, TAU Mitreni, Călărași county, necropolis of the. IV century in the cemetery;
77. Oltenița, "Rățărie", TAU Oltenița, Călărași county, Medieval Necropolis; NAR code: 100629.10
78. Oltenița, "Potcoava", TAU Oltenița, Călărași county, Medieval settlement; NAR code: 100629.11
79. Oltenița, "Renie", TAU Oltenița, Călărași county, Eneolithic settlement Cernavoda I, Hallstattian settlement Basarabi culture, La Tène Getic settlement, Early Medieval settlement, Dridu culture; NAR code: 100629.04, LHM code 2015: CL-I-s-B-14566
80. Oltenița, TAU Oltenița, Călărași county, Carantinei building, XIX century; NAR code: 100629.05.

An archaeological study was carried out in 2023 and formed the basis of the Feasibility Study (attached to this Impact Assessment). The conclusions of this study are presented below.

The research carried out has provided valuable overall information on the archaeological heritage existing along the Argeș and Dâmbovița rivers. All archaeological sites investigated will be mapped, so that their spatial distribution can be ascertained, they will also be dated, according to site recording sheets, in which the state of preservation of the site will be recorded, as well as any archaeological research carried out on the site, publications, etc. Archaeological field diagnostics will enable known sites to be protected during the execution of the river control works and, where this is not possible, preventive archaeological excavations will be made to free the land from archaeological burden.

Through the theoretical assessment phase of the archaeological diagnosis on the route of the river control works from Oltenița to Budești and then from Cornetu - Mihăilești to Budești and from Glina to Budești we made a list of the archaeological potential of the area under review.

The specialist archive has been researched with reference to archaeological sites along the route of the river control works.

The archaeological sites known and investigated so far have been identified based on documents and will be verified in the field.

All identified sites will be provided with a Field Technical Evaluation Sheet and an Archaeological Site Recording Sheet, containing location data, GPS coordinates, and site description, including bibliographical references where appropriate and a photographic image of the site.

In the present survey, 44 archaeological sites were delimited on the Dâmbovița river and 34 on the Argeș river. However, most of these sites are on terraces and very far from the planned route of the river control works. The archaeological sites located at a distance of less than 500 m from the route of the planned works will be positioned on the 1/2000 scale plans in order to be monitored during the construction works of the investment (archaeologically supervised), and in case of possible damage, the procedure of preventive archaeological research will be triggered (Fig. 9).

Specialised proposals:

I. Provisions for demarcated areas/perimeters of archaeological sites located within or outside the built-up area of localities

Allowed functions:

a) agricultural crops that do not exceed 25-30 cm digging depth and do not require the movement of heavy machinery;
b) grazing;
c) signposting and enhancement of the monument;
d) archaeological research.

Prohibited functions:

a) ploughing deeper than 30 cm;
b) any type of activity involving the construction of buildings, annexes, installations, networks, etc., prior to obtaining the archaeological clearance certificate.

Legal provisions:

- ✓ *carrying out any works that may affect archaeological sites, in the absence of an archaeological clearance certificate (RO: certificatul de descărcare de sarcină arheologică) is considered destruction of historical monuments and is punishable according to the provisions of criminal law*.
- ✓ *the dismantling, partial destruction or degradation of archaeological sites that are historical monuments is punishable under criminal law*.

Temporary building ban:

a) until the preventive archaeological survey and the issuance of the archaeological clearance for the land related to the proposed investment; the archaeological survey and the issuance of the archaeological clearance certificate will be carried out in accordance with the law.

Authorisation conditions:

a) approval from the County Department for Culture (archaeological clearance certificate);
b) preventive, preliminary archaeological research.

Legal provisions:

- ✓ *the costs of archaeological research shall be borne by the beneficiaries of the investment, in accordance with the legal provisions.*

II. Provisions for areas of protection of archaeological sites 2 located within or outside the built-up areas of localities

Allowed functions: all allowed functions.
Prohibited functions: all prohibited functions.

Authorisation conditions:

a) approval from the County Directorate for Culture
b) all works that will affect the ground will be archaeologically supervised, in accordance with the law;
c) in the event that archaeological materials (movable goods) are found during the execution of the works, the works will be stopped for as long as it is necessary for the specialised institution to record and collect them;
d) in the event that built archaeological remains are discovered, an archaeological clearance 3 will be requested for the area of land related to the proposed investment, and the works will be halted in that portion for as long as it will be necessary for the specialised institution to carry out exhaustive preventive archaeological research;
e) in the event of the discovery of archaeological remains of particular importance, which cannot be excavated or relocated, the beneficiary will modify / complete the project in such a way that they will not be affected by the proposed works.

Legal provisions:

- ✓ *failure to report archaeological discoveries resulting from construction or demolition works constitutes an offence and is punishable according to the provisions of the law.*

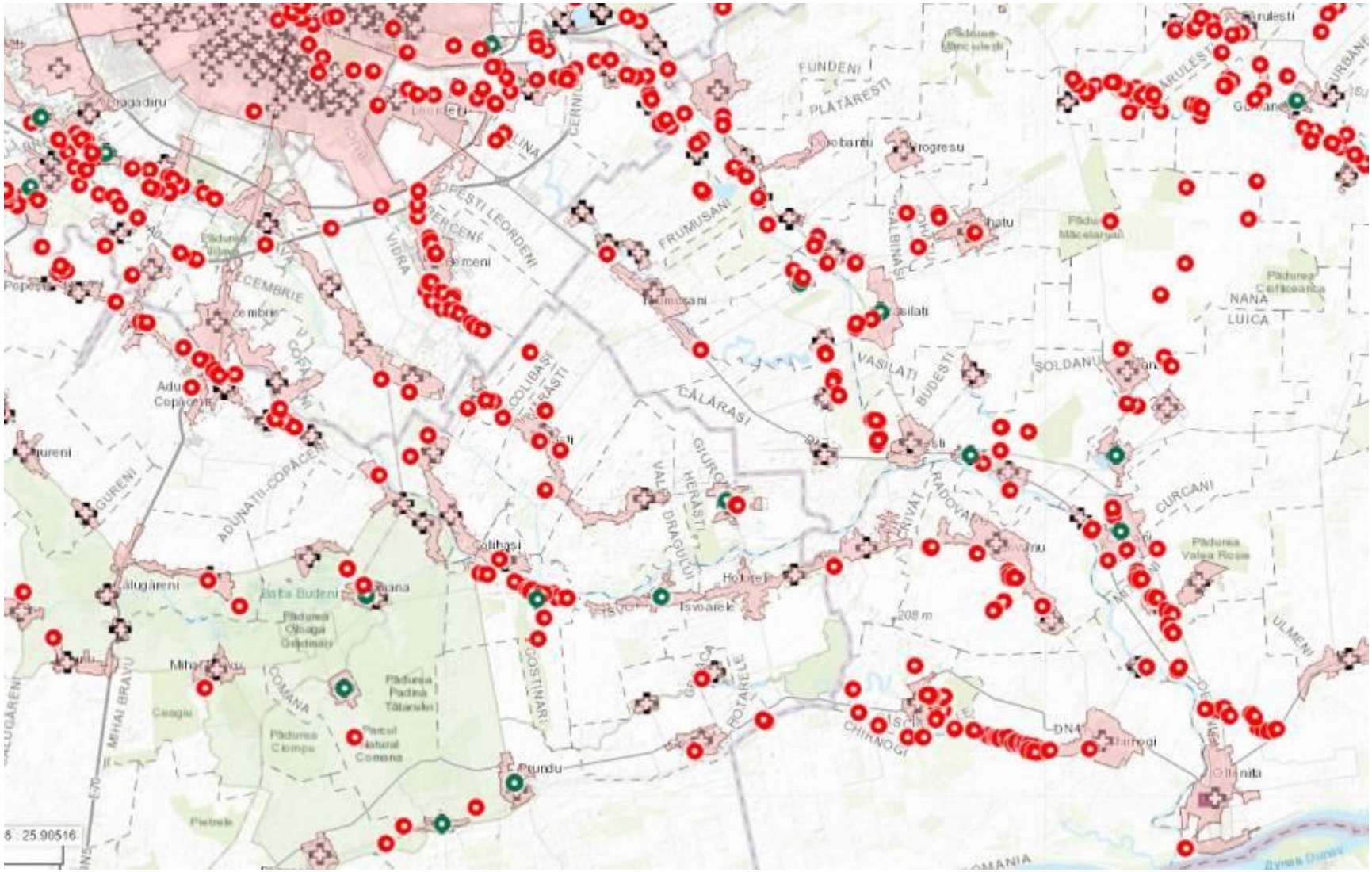


Figure no. 9 - Location of places of worship in the area neighbouring the site under survey

2.3 Description of the main physical characteristics of the project

2.3.1. Current situation

The **site of the works** is located on the Argeș river downstream of the Mihăilești - Cornetu lake and on the Dâmbovița river downstream of the bridge on the Bucharest ring road, in the counties of Ilfov, Giurgiu and Călărași.

The **navigable waterway** - has a length of 73 km on the Argeș river and takes up a difference in level of 53 m through 4 hydrotechnical nodes (HNs), and on the Dâmbovița river a length of 31 km with a difference in level of 14.60 m, taken up by 2 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and 40.0 m on the Dâmbovița river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.

At present, the land related to the objective is located mainly on the public domain of the State and partly on the private domain of the residents.

At present, the land related to the objective is located mainly on the public domain of the State and partly on the private domain of the residents.

The main objectives expected to be achieved by implementing the investment are the following:

- ✓ **navigation** - linking Bucharest with the Danube ensures direct access to the port of Constanța, to the main cities along the Danube, as well as to the European inland waterway network;
- ✓ **flood defence** - for 11 localities, 9,800 households, approx. 50.000 ha of land, 378 km of roads, 5 km of railway and 126 socio-economic objectives;
- ✓ **water supply and irrigation** - to neighbouring localities, irrigation of approx. 50 thousand ha., dewatering of approx. 30 thousand ha, production of electricity - 126 GWh/year, as well as fish farms on 1,250 ha;
- ✓ **social benefits** - by providing conditions in the area for: the development of related objectives and activities, the creation of logistic zones and industrial parks, the increase of the economic potential of the neighbouring localities, including job creation and the absorption of unemployment.

The present Feasibility Study is an update of the Study approved by the Technical and Economic Committee of the Ministry of Transport and Infrastructure by Approval No 71/80 of 19 July 2012 and by the Interministerial Council for the Approval of Public Works of National Interest by Approval No 42 of 17 August 2012.

The water link between Bucharest and the Danube has been of interest since the end of the 19th century. In 1929, the Romanian Parliament adopted the "*Law for the Construction of the Argeș - Bucharest - Danube Canal*". The economic recession of 1930-1933 and the pre-war situation made it impossible to start its construction.

After 1960, new studies were conducted on the water link from Bucharest to the Danube.

Since the floods between 1970 and 1980 caused major damage, in May 1982 the Ministry of Transport and Telecommunications was given the task of drawing up studies and documentation for the development of the river control works on Argeș river. In July 1984, Bucharest was linked to the Danube by the Argeș and Dâmbovița rivers.

In 1986 works began under the project "River control works on Argeș river for navigation, irrigation and other uses" and in 1988 on the Dâmbovița River.

In January 1990, when work on the Argeș and Dâmbovița rivers was at a very advanced stage, they were suspended and abandoned due to a lack of financial resources.

In September 2009, the Feasibility Study for the "River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses" was contracted. The vandalization of the concrete constructions and the degradations found in place made it necessary to prepare technical expert reports on them in order to enable the further preparation of the FS.

The Feasibility Study has been approved by the Technical and Economic Committee of the Ministry of

Transport and Infrastructure by Approval No 71/80 of 19 July 2012 and by the Interministerial Council for the Approval of Public Works of National Interest by Approval No 42 of 17 August 2012.

Consultations with the Ministry of Public Finance have been carried out in order to finalise the draft government decision for the approval of the objective and to put it on the approval circuit. It was established that the objective should be promoted for approval by two government decisions, one for the approval of the expropriation corridor and one for the technical-economic indicators, and that the Ministry of Transport (MT) should have identified the source of financing.

On 02 September 2020 the Minister of Transport and Infrastructure approved the Notice of opportunity on the inclusion in the National Recovery and Resilience Plan of the investment objective "River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses".

On 21 October 2020, the Minister of Transport and Communications Infrastructure signed Order No 1940 approving the Memorandum on the necessity and appropriateness of incurring expenses related to the updating of the feasibility study for the investment objective: "River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses".

When the works for the complex river control works on the Argeș and Dâmbovița rivers were halted in January 1990 and the site was left, the following main works had been performed (table 4-6):

The following volumes of control works had been performed on the **Argeș river** for navigation:

- 73% of the total volume of 96.9 million m^3 of excavations;
- 69% of the total volume of dykes totalling 47.8 million $m^{3;}$
- 39% of the quantity of 2,125 thousand m^3 of concrete;
- 46% of the 1285 thousand m^2 of concrete cut-off walls;
- 36% of the area of defences and embankment protection totalling 4.6 million $m^{2;}$
- 24% of the total quantity of hydromechanical equipment of approx. 11.4 thousand tonnes.

Moreover, more than 80 per cent of the following works had been executed:

- infrastructure of the platforms of Oltenița and Bucharest ports;
- bridges over roads and the railway bridge at Grădiștea over the navigable Argeș river;
- crossings of power lines and pipelines over the improved river;

the most difficult works were also at an advanced stage of execution, such as:

- the foundations of hydrotechnical nodes (the floor beds of locks, wasteways and hydroelectric power plants);
- the outports related to hydrotechnical nodes.

The following control works had been performed on the **Dâmboviţa river** for navigation:

- river bed development in the 3rd reach, between the port of Glina Harbour and the HN of Tânganu;
- works for the defence and protection of the slopes on the 3rd reach with reinforced concrete slabs;
- at the Port of Glina, the mooring quays and approx. 30% of the port platforms had been built;
- at the HN of Tânganu, the simple lock is limited to concreting the lock chamber up to the level and construction of the upstream head;
- partial roads for emergency interventions on the Glina - Tânganu reach.

Downstream of the HN if Tânganu, on the Dâmbovița river, no works had been carried out to improve navigation.

The volume and state of the works performed on the two rivers up to the end of 1989 have been mentioned above. The updated value of the works performed until the end of 1989 on the Argeș and Dâmbovița rivers amounts to more than €2.7 billion, excluding VAT.

By Government Decision No 487/2008, the Ministry of Transport through Compania Naţională Administraţia Canalelor Navigabile SA (National Company for the Administration of Navigable Canals) took over from the Ministry of Environment and Sustainable Development under the administration of the National Administration "Romanian Waters" the objective "River control works on the Argeș River

for flood defence, irrigation and other uses", as well as some state-owned public property on the Dâmbovița river, in order to create a navigable waterway from Bucharest to the Danube, through the new objective: "River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses".

Table no. 4 - The dams on the Argeș river, built between 1986 – 1990 (1994) to be demolished

No.	Work	Area (m2)	County/Locality	Observations
Reach 0 (km 0+000 - km 2+282)	Concrete beam Mst Mdr	 137 39	Municipality of Oltenița; county of Călărași: Chirnogi commune	
	Concrete slab revetment Mst Mdr	 3417 1320		
	Precast elements Mst Mdr	 2733 1056		
Reach 1 (km 2+282 - km 28+351)	Concrete beam Mst Mdr	 584 811	Municipality of Oltenița; county of Călărași: Commune of Chirnogi; Commune of Clătești; Commune of Mitreni; Commune of Curcani; Commune of Radovanu; Commune of Șoldanu; Commune of Crivăț	
	Concrete wall head beam Mdr	 2		
	Concrete slab revetment Mst Mdr	 24216 11690		
	Rockfill Mst Mdr	 15 15		
	Monolithic concrete slab revetment Mst Mdr	 5893 9032		
	Flexible concrete slabs Mst Mdr	 10140 28392		
	Precast elements with voids Mst Mdr	 7638 10585		
	Walls			
	Concrete wall built using a Kelly bar Mst Mdr	 27800 15318		These works are not being demolished, they will remain in place and a new wall will be built in front of
	Wall made using a Kelly bar with self-curing mud Mst Mdr	 1700 0		

No.	Work	Area (m2)	County/Locality	Observations
	Concrete wall Mst Mdr	 4635 0		the existing one
Reach 2 (km 28+351-53+609)	Flexible concrete slabs Mst Mdr	 45158 27819	Municipality of Oltenița; County of Călărași: Commune of Budești; Commune of Crivăț; County of Giurgiu: Commune of Hotarele; Commune of Izvoarele; Commune of Teiușu; Commune of Mironești; Commune of Gostinari	
	Concrete beam Mst Mdr	 1950 629		
	Precast elements with voids Mst Mdr	 1593 323		
	Walls			
	Concrete wall built using a Kelly bar Mst Mdr	 39300		These works are not being demolished, they will remain in place and a new wall will be built in front of the existing one
Reach 3 (km 53+609 - km 63+134)	Monolithic concrete slabs Mst Mdr	 14 7	County of Giurgiu: Commune of Colibași; Commune of Falaștoaca, Commune of Grădiștea, Commune of Mogoșești	
	Flexible concrete slabs Mst Mdr	 4287.5 2182.5		
	Precast concrete slabs Mst Mdr	 on average, 5.60 on average, 5.45		
	Concrete beam Mst Mdr	 1622 843		
	Concrete wall head beam Mst Mdr	 0.5 0.5		
	Precast elements with voids Mst Mdr	 2023 6582		
	Walls			
	Concrete wall built using a Kelly bar Mst	 31650		These works are not being

No.	Work	Area (m2)	County/Locality	Observations
	Mdr	39195		demolished, they will remain in place and a new wall will be built in front of the existing one
Reach 4 (km 63+134 - km73+424) and Reach 5 - Regularisation sector (km 73+424 - km 82+918)	Concrete wall head beam Mst Mdr	 2 0	County of Giurgiu: Commune of Varlaam; County of Ilfov: Commune of Copăceni; Commune of Adunații Copăceni; Commune of 1 Decembrie; Commune of Dărăști Vlașca; Commune of Dărăști Ilfov; Commune of Dumitrana; Commune of Măgurele	
	Monolithic concrete slabs Mst Mdr	 23722 4146		
	Regularisation sector Mst Mdr	 1188 1188		
	Precast concrete slabs Mst Mdr	 5397 23434		
	Regularisation sector Mst Mdr	 16578 11200		
	Concrete beam Mst Mdr	 0.48 0.48		
	Flexible concrete slabs Mst Mdr	 11761 17553		
	Precast elements with voids Mst Mdr	 3.2 med.4.8		
	Walls			
	Concrete wall built using a Kelly bar Mst Mdr	 31660 11500		These works are not being demolished, they will remain in place and a new wall will be built in front of the existing one

Table no. 5 - The dams on the Argeș river, built between 1986 – 1990 (1994) to be rehabilitated

No.	Work	Area (m2)	County/Locality	Observations

No.	Work	Area (m2)	County/Locality	Observations
Reach 0 (km 0+000 - km 2+282)	Concrete beam Mst Mdr	 548 220	Municipality of Oltenița; county of Călărași: Chirnogi commune	
	Concrete slab revetment Mst Mdr	 10249 3958		
	Rockfill Mst Mdr	 50 50		
	Precast elements Mst Mdr	 10932 4222		
Reach 1 (km 2+282 - km 28+351)	Concrete beam Mst Mdr	 1361 1893	Municipality of Oltenița; county of Călărași: Commune of Chirnogi; Commune of Clătești; Commune of Mitreni; Commune of Curcani; Commune of Radovanu; Commune of Șoldanu; Commune of Crivăț	
	Concrete wall head beam Mdr	 2		
	Concrete slab revetment Mst Mdr	 36323 17534		
	Rockfill Mst Mdr	 15 15		
	Monolithic concrete slab revetment Mst Mdr	 23570 36125		
	Flexible concrete slabs Mst Mdr	 40560 113568		
	Precast elements with voids Mst Mdr	 30552 42340		
	Walls			
	Concrete wall built using a Kelly bar Mst Mdr	 27800 15318		These works are not being demolished, they will remain in place and a new wall will be built in front of the existing one
	Wall made using a Kelly bar with self-curing mud Mst Mdr	 1700 0		
	Concrete wall Mst	 4635		

No.	Work		Area (m2)	County/Locality	Observations
	Mdr	0			
Reach 2 (km 28+351-53+609)	Flexible concrete slabs Mst Mdr	 30105 18546		Municipality of Oltenița; County of Călărași: Commune of Budești; Commune of Crivăț; County of Giurgiu: Commune of Hotarele; Commune of Izvoarele; Commune of Teiușu; Commune of Mironești; Commune of Gostinari	
	Concrete beam Mst Mdr	 1300 419			
	Rockfill Mst Mdr	 4 4			
	Precast elements with voids Mst Mdr	 1062 215			
	Walls				
	Concrete wall built using a Kelly bar Mst Mdr	 39300			These works are not being demolished, they will remain in place and a new wall will be built in front of the existing one
Reach 3 (km 53+609 - km 63+134)	Monolithic concrete slabs Mst Mdr	 6 5		County of Giurgiu: Commune of Colibași; Commune of Falaștoaca, Commune of Grădiștea, Commune of Mogoșești	
	Flexible concrete slabs Mst Mdr	 4287.5 2182.5			
	Precast concrete slabs Mst Mdr	 on average, 5.60 on average, 5.45			
	Concrete beam Mst Mdr	 696 562			
	Concrete wall head beam Mst Mdr	 0.5 0.5			
	Precast elements with voids Mst Mdr	 1349 4388			
	Walls				
	Concrete wall built using a Kelly bar				These works

No.	Work	Area (m2)	County/Locality	Observations
	Mst Mdr	31650 39195		are not being demolished, they will remain in place and a new wall will be built in front of the existing one
Reach 4 (km 63+134 - km73+424) and Reach 5 - Regularisation sector (km 73+424 - km 82+918)	Concrete wall head beam Mst Mdr	 2 0	County of Giurgiu: Commune of Varlaam; County of Ilfov: Commune of Copăceni; Commune of Adunații Copăceni; Commune of 1 Decembrie; Commune of Dărăști Vlașca; Commune of Dărăști Ilfov; Commune of Dumitrana; Commune of Măgurele	
	Monolithic concrete slabs Mst Mdr	 15815 2764		
	Regularisation sector Mst Mdr	 792 792		
	Precast concrete slabs Mst Mdr	 5397 23434		
	Regularisation sector Mst Mdr	 16578 11200		
	Concrete beam Mst Mdr	 0.48 0.48		
	Regularisation sector Mst Mdr	 0.4;0.24 0.4;0.48		
	Flexible concrete slabs Mst Mdr	 11761 17553		
	Precast elements with voids Mst Mdr	 3.2 med.4.8		
	Walls			
	Concrete wall built using a Kelly bar Mst Mdr	 31660 11500		These works are not being demolished, they will remain in place and a new wall will be built in front of the

No.	Work	Area (m2)	County/Locality	Observations
				existing one

Table no. 6 - Other works realised between 1986 and 1990 to be rehabilitated

No.	Name of work to be rehabilitated	Area (sq. m)	Locality / County	Description of rehabilitation works
1	HN 1 Tânganu	2,500.00	Oltenița / County of Ilfov	Repairs of concrete structures of the lock, power plant
2	HN 1 Oltenița	6,000.00	Oltenița / County of Călărași	Repairs of concrete structures of the dam, lock, power plant
3	HN 2 Budești	6,000.00	Budești / County of Călărași	Repairs of concrete structures of the dam, lock, power plant
4	HN 3 Colibași	4,750.00	Colibași / County of Giurgiu	Repairs of concrete structures of the dam, lock, power plant
5	HN 4 Copăceni	3,500.00	Adunații Copăceni / County of Giurgiu	Repairs of concrete structures of the dam, lock, power plant
6	Crossing over DN4 national road at Budești km 1+093-Dâmbovița	21000	Budești / County of Călărași	Construction of new bridge, carriageway, sidewalks
7	Crossing over DC55 local road Cernica-Bălăceanca km 25+713 - Dâmbovița	8800	Cernica / County of Ilfov	Demolition of existing bridge, construction of new bridge, carriageway, sidewalks
8	Crossing over DJ 100 county road Fundeni-Pițigaia km 20+472 - Dâmbovița	8320	Fundeni / County of Ilfov	Demolition of existing bridge, construction of new bridge, carriageway, sidewalks
9	Crossing over DJ412 county road Vasilați-Nuci - Dâmbovița km 6+442	10800	Vasilati /County of Călărași	Demolition of existing bridge, construction of new bridge, carriageway, sidewalks

Existing situation of the investment objective according to technical expert report

I. Argeș Canal

Premises of the works

The premises of the works for the 4 HNs of the Danube-Bucharest canal on the Argeș river will shelter during the execution period the construction works of the node, namely: the dam, the power station and the 2 twinned locks.

They are located in the minor bed of the Argeș river, which is diverted through a diversion fairway.

The coffer dam of the premises and fairway are sized for the design flow plus 5% reserve ($Q_{5\%}$ = 1360 m3/sec).

The packing of the premises is done with a high-performance wall built using a Kelly bar at the foot of the downstream slope of the coffer dam or in the axis of the dyke.

The parts of the construction works already performed in the original premises have suffered degradation and vandalization due to the cessation of construction after 1990.

The tower cranes on the premises and pumping stations were dismantled after 1990.

Vegetation has grown on the downstream slopes and on the crests of dykes.

Access roads to and from the premises are destroyed (impassable).

Due to the floods travelling through the fairways during the period after the closure, fairways were deepened by 3÷4 m.

i. Hydrotechnical Node HN1 of Oltenița

At HN1, all the foundations of the component construction works were concreted. The following works were performed: wall built using a Kelly bar on the upstream area, wall built using a Kelly bar at the downstream boundary of the energy section, wall built using a Kelly bar perimeter corresponding to the M.S. lock (towards the hydropower plant). According to information from the construction phase, the cut-off wall built using a Kelly bar is 80 cm wide, 15 m deep, and the material used is hydrotechnical concrete, BH200, permeability P8, in accordance with the code of practice for concrete production CP 012/1-2007, for concrete constructions with specified recipe.

On-site layout:

- M.S - sluice
  - Hydropower plant
- M.D – twinned locks

Overflow weir

The stage reached in terms of physical implementation is as follows::

- the floor bed of spillways is concreted at 14.50 mdMB level upstream;
- the hump in the spillways - was not executed;
- intermediate piers - concreted piles up to 16.50 mdMB level;
- left bank abutment - 20.30 mdMB upstream and 13.00 mdMB downstream;
- the floor bed of the wave trap at step I and step II - concreted to final elevations, except for the teeth and downstream sills of both steps;
- the sections of the ballast wall and the closing wing - not concreted;
- the cut-off wall of the area upstream of the dam - power-plant - built, minus the closing beam of cut-off strips with the spill profile;
- the cut-off wall located at the downstream end of the containment berm made of concrete;
- the containment berm was not executed.

Power plant

The stage reached in terms of physical implementation is as follows::

- the cut-off wall from the upstream limit on the entire length of the plant, and the one from the downstream limit up to the containment level;
- backfill and levelling concrete, single-aggregate concrete and ballast backfill over the entire width of the power plant and stilling basin;
- the upstream foot wall of the floor bed adjacent to the cut-off wall up to different elevations for T1, T2 (11.25 mdMB and 14.50 mdMB respectively) and the spillways (14.50 mdMB);
- sloping area of the floor bed up to approx. 10 m upstream of the turbine centre line, corresponding to T1, T2 and spillways;
- the floor bed and a portion of the infrastructure up to the upper level of the draft tube elbow, the draft tube, including the deck slab over the draft tube, related to T1 and T2 turbine area (6.25 mdMB) and draft tube (7.20 mdMB);
- the full length of the floor bed and the piers between the spillways in the downstream area up to different heights depending on the cast segments, corresponding to the spillways (8.00 mdMB and 11.50 mdMB, respectively);
- spillways sheeting fitted;
- the slabs of the stilling basin, the energy dissipator in the spillway area, and the separating pier between the stilling basin and the dissipator have been concreted to the final elevation.

Twinned locks

The stage reached in terms of physical implementation is as follows::

- the floor bed of the upstream head has been concreted in steps, with elevations ranging between 13.50 and 6.50 mdMB;
- the upstream link area has the foundation slab concreted up to elevation 5.00 mdMB (the anchoring rod zone with a height of 1.00 m remains not concreted);
- the right-bank abutment has been concreted to the final elevation – 21.00 mdMB;
- the MD sidewall of MD lock is concreted along the entire length of the head at an elevation of 13.50 mdMB;
- the lock chamber floor beds are concreted up to the level of the anchoring rod - 5.00 mdMB including the sidewalls.
- the floor beds of the downstream ends are concreted up to 3,30 mdMB.
- the floor bed of the link area to MS lock is concreted up to 5.00 mdMB (below the anchoring rod).

The concrete poured in the right-bank abutment and upstream locks, as well as in the left-bank abutment of the sluice and the upstream area of the sluice and power plant, appears neat and compact, with smooth formwork surfaces, free of segregation or honeycombing, and with no signs of calcite efflorescence or cement laitance leakage.

ii. Hydrotechnical Node HN2 of Budești

Within HN2 all the foundations of the component construction works were concreted (except the sloping portion of the upstream ends). As in HN1, walls built using a Kelly were made at all the works and at the upstream front, at M.S - the sluice and hydropower plant, and M.D - twinned locks, respectively.

According to information from the construction phase, the cut-off wall built using a Kelly bar is 80 cm wide, 15 m deep, and the material used is hydrotechnical concrete, BH200, permeability P8, in accordance with the code of practice for concrete production CP 012/1-2007, for concrete constructions with specified recipe.

Overflow weir

The stage reached in terms of physical implementation is as follows::

- the cut-off wall of the area upstream of the dam - power-plant, minus the closing beam of cut-off strips with the spill profile;
- the hump in the spillways - was not executed;
- the upstream floor bed of the sluice at the final elevation 27.50 mdMB is executed.
- Intermediate piers - concreted up to 34.10 mdMB and 34.20 mdMB respectively;
- the intermediate pier between the sluice and the hydroelectric power plants is concreted at 34.00 mdMB over the entire length of the project;
- the M.S. closing abutment is concreted in steps (36,40 ÷ 32,52 mdMB) along the entire length;
- the right-bank abutment - concreted up to 34.00 mdMB;
- the upstream left bank connecting wall is done up to 33.50 mdMB;
- the 2-stage energy dissipator is concreted 100% to final elevations, except for the downstream teeth and sills in both steps;
- the sections of the ballast wall and the closing wing are concreted up to an elevation of 30.50 mdMB;
- the cut-off wall located at the downstream end of the containment berm made of concrete;
- the floor bed of the containment berm, minus the baffle tiles.

Power plant

The stage reached in terms of physical implementation is as follows::

- the cut-off wall at the upstream limit on the entire length of the plant up to the containment level, except for the last section on the surface which includes the cut-off strips;

- backfill and levelling concrete, single-aggregate concrete and ballast backfill over the entire width of the power plant and stilling basin;
- the upstream foot wall of the floor bed adjacent to the cut-off wall up to the final elevation, corresponding to T1, T2 and the wasteways (27.50 mdMB);
- hydraulic circuit intermediate pier and wasteway block concreted at a level of 32.50 metres along the entire length.
- the HPP wall towards the MS lock is concreted along the entire length of the project at 32.50 mdMB.
- sloping area of the floor bed up to approx. 10 m upstream of the turbine centre line, corresponding to T1, T2 and spillways;
- the floor bed and a portion of the infrastructure up to the upper level of the draft tube elbow, the draft tube, including the deck slab over the draft tube, related to T1 and T2 turbine area (21.25 mdMB) and draft tube (21.90 mdMB);
- the floor bed of the wasteways where the sheeting is mounted;
- the sheeting is mounted on the wasteway block (and anchored in concrete) on the 2 galleries;
- the stilling basin slabs, the 2-stage energy dissipater in the extension of the dissipater at the sluice, including the separating pier between the stilling basin and the sluice, are finished.

Twinned locks

The stage reached in terms of physical implementation is as follows::

- the floor bed of the upstream head (sloped part) is blocked up to 19.25 mdMB - MS lock and 16.75 mdMB - M.D. lock;
- the floor bed of the upstream linking area is concreted at both locks up to the level of the anchoring rod - 18.25 mdMB;
- the floor bed of the M.S. lock chamber is at the same elevation (anchoring rod - 18.25 mdMB) minus 2 plots;
- the floor bed of the MD - the foundation is covered with h = 1.50 m up to the floor bed of the lock inlet galleries (main and secondary);
- the downstream linking area to the MS lock is concreted up to 1.50 m below the floor bed elevation (19.25 mdMB);
- the downstream linking area to the MD lock is concreted at the level at which the lock chamber is concreted - 14.75 m mdMB;
- the downstream head of the MS lock is concreted to the level of the reinforcement anchoring rod (18.25 mdMB);
- the downstream head at the MD lock is concreted in 2 steps of 15.75 and 17.05 mdMB, downstream.

The concrete poured in the dam, powerplant and lock is fairly compact, with partially smooth casting faces interrupted from place to place by concrete edges of varying thickness due to the unevenness of the formwork used to pour the concrete. These non-conformities are sometimes quite large vertically (sized 4-5 cm). The moulded faces of the concrete have many segregated (up to 5 cm deep inside the vertical elements) or burred areas, with calcite exfiltrations and cement slurry leakage through vertical cracks at the 2 piers and the left bank abutment of the sluice within the HN2 of Budești. Horizontal cracks were also observed in the floor bed of the dam in the middle of the centre opening.

iii. Hydrotechnical Node HN3 of Colibași

At HN3, all the foundations of the component construction works were concreted. All the cut-off walls using a Kelly bar were made as they were designed for the upstream front and at the other works.

According to information from the construction phase, the cut-off wall built using a Kelly bar is 80 cm wide, 15 m deep, and the material used is hydrotechnical concrete, BH200, permeability P8, in accordance with the code of practice for concrete production CP 012/1-2007, for concrete constructions with specified recipe.

Overflow weir

The stage reached in terms of physical implementation is as follows::

- the cut-off wall of the area upstream of the dam - power plant built - up to 37.50 mdMB, minus the closing beam of cut-off strips with the spill profile;
- the upstream floor bed of the 2 openings is concreted at the project level of 40.50 mdMB
- the hump in the spillways - was not executed;
- the separating pier and intermediate pier between the sluice and the HPP are concreted along their entire length at 47.00 and 47.50 mdMB.
- the left bank abutment - executed on the entire length at the project elevations (49.00 and 44.50 mdMB);
- the right bank abutment - concreted up to 44.50 mdMB
- energy dissipating basin executed 100%.
- section I of the ballast wall of the dissipator - not concreted;
- sections II, III, IV of the ballast wall of the dissipator - concreted up to the level of 44.50 mdMB (final level) for 90%;
- the sections of the closing wing of the ballast wall of the dissipator - concreted up to 44.50 mdMB for 90%;
- the cut-off wall located at the downstream end of the containment berm made of concrete - was not built;
- the containment berm was not executed.

Power plant

The stage reached in terms of physical implementation is as follows::

- the cut-off wall at the upstream limit on the entire length of the plant up to the containment level, except for the last section on the surface which includes the cut-off strips;
- backfill and levelling concrete, single-aggregate concrete and ballast backfill over the entire width of the power plant;
- corresponding to wasteways, the foot wall of the water intake at the final elevation (40.50 mdMB), the inclined portion, except for the transition area between the horizontal area of the water intake and the inclined area of the sheeting;
- on the wasteway area, the metal sheeting has been completely encased on the downstream area, and the floor above them is concreted at 41.80 and 39.80 mdMB respectively;
- the floor bed in the turbine area is complete;
- the piers on the water intake area were executed in steps between 41.00 mdMB and 50.50 mdMB;
- the suction chambers, including the slab above the suction chambers, and the downstream pressure wall up to an elevation of 39.00 mdMB;
- the spiral chambers, including the floor above the spiral chambers at elevation 39.00 mdMB.

Twinned locks

Left bank lock

The stage reached in terms of physical implementation is as follows::

- the floor bed of the upstream head and the upstream link area are realised at the project elevation;
- the lock chamber is concreted at project elevation 32.25 mdMB, less 1 plot adjacent to the downstream link area;
- the downstream link area is at 27.75 mdMB;
- the downstream head is concreted upstream at 27.75 metres above sea level and at 30.75 metres above sea level in the downstream area.

Right bank lock

The stage reached in terms of physical implementation is as follows::

- the MD abutment is concreted in steps at the upstream head between 47.50 ÷ 38.75 mdMB;

- along the length of the sluice the sluice is concreted at 37.50 mdMB;
- the right bank of the upstream head is concreted, including the lock inlet gallery housed in it;
- the floor bed is poured on the overfall area up to the horizontal area where it is located at the level of the anchoring rod of 31.25 mdMB;
- the floor bed of the lock chamber is at the final elevation, except for 3 plots where the elevation is at the mounting level of the anchoring rod of 31.25 mdMB;
- the link area and the downstream head are at 27.75 mdMB.

The concrete poured in the dam, powerplant and lock is neat and compact, with smooth casting faces, with rare segregated or burred areas and no cement slurry leakage. In the floor bed area of the wasteway lock, a longitudinal crack was observed in the middle of the floor bed field starting from the right bank abutment and stopping at the common lock-power plant pier.

iv. Hydrotechnical Node HN4 of Copăceni

At HN4, all the foundations of the component construction works were concreted. It is the most advanced HN in terms of execution.

According to information from the construction phase, the cut-off wall built using a Kelly bar is 80 cm wide, 15 m deep, and the material used is hydrotechnical concrete, BH200, permeability P8, in accordance with the code of practice for concrete production CP 012/1-2007, for concrete constructions with specified recipe.

The cut-off walls using a Kelly bar are executed according to the design at all the construction works of the node.

On-site layout:

- M.D – twinned locks
  - Hydropower plant
- M.D - sluice

Overflow weir

The stage reached in terms of physical implementation is as follows:

- is executed in steps with the right bank abutment along its entire length, including the closing abutment on the right bank;
- the floor bed of the spillway openings - concreted at 53.50 mdMB upstream and in steps (following the levelling plane) downstream up to 48.00 mdMB;
- the hump in the spillways - was not executed;
- the intermediate pier between the sluice and the HPP is built in steps, and oriented downstream;
- the intermediate pier is executed in 2 steps at 54.50 mdMB upstream and at 48.50 mdMB downstream;
- the floor bed of the wave trap at step I and step II - concreted, except for the teeth and downstream sills of both steps;
- sections III and IV of the ballast wall of the dissipator - concreted up to 49.00 mdMB;
- sections I and II of the ballast wall of the dissipator - concreted up to 50.50 mdMB;
- section IV of the closing wing of the ballast wall of the dissipator - concreted up to 49.00 mdMB;
- section IV of the closing wing of the ballast wall of the dissipator - concreted up to 44.00 mdMB;
- the cut-off wall of the area upstream of the dam - power-plant - built, minus the closing beam of cut-off strips with the spill profile;
- the cut-off wall located at the downstream end of the containment berm made of concrete;
- the containment berm was not executed.
- Power plant

The stage reached in terms of physical implementation is as follows::

- the cut-off wall at the upstream limit on the entire length of the plant up to the containment level, except for the last section on the surface which includes the cut-off strips;
- backfill and levelling concrete, single-aggregate concrete and ballast backfill over the entire width of the power plant and stilling basin;
- the upstream foot wall of the floor bed adjacent to the cut-off wall up to the final elevation, corresponding to T1, T2 and the wasteways (53.50 mdMB);
- the sloping area of the floor bed up to approx. 10 m upstream of the turbine centreline, corresponding to T1, T2 and spillways;
- the floor bed and a portion of the infrastructure up to the upper level of the draft tube elbow, the draft tube, including the deck slab over the draft tube, related to T1 and T2 turbine area (46.50 mdMB) and draft tube (47.90 mdMB);
- the floor bed of the wasteways where the sheeting is mounted;
- the sheeting of the galleries of the block of wasteways is encased in concrete.
- the stilling basin slabs, the dissipator in the wasteway area.
- the abutments towards the sluice and M.D. Lock. are concreted

Twinned locks

- the floor bed of the link area to MD lock is concreted up to 42.00 mdMB.

Left bank lock

The stage reached in terms of physical implementation is as follows::

- is concreted in steps, the abutment towards the shore, at the upstream end;
- the floor bed of the upstream head is concreted in steps on the sloping area (spillway) between the elevations
  49.25 mdMB and 44.25 mdMB (installation elevation, reinforcement anchoring rod);
- upstream link area - the floor bed is concreted at a final elevation of 45.25 mdMB.
- lock chamber – the floor bed is concreted at a final elevation of 45.25 mdMB.
  - the MS sidewalls are concreted up to 47.25 mdMB.
- downstream link area - the floor bed is concreted up to 43.05 mdMB.
  - the M.S. sidewalls are concreted up to 47.25 mdMB.
- downstream end - the floor bed is concreted up to the installation level of the reinforcing anchoring rod.
  - the MS sidewall is concreted up to 47.25 mdMB.

Right bank lock

The stage reached in terms of physical implementation is as follows::

- is concreted in steps, the abutment towards the shore, at the upstream end;
- the floor bed of the upstream head is concreted in steps on the sloping (overflowing) area between 49.25 mdMB and 44.25 mdMB (installation elevation, reinforcing anchoring rod);
- upstream link area - the floor bed is concreted at a final elevation of 45.25 mdMB;
- lock chamber - the floor bed is concreted at a final elevation of 45.25 mdMB.
- downstream link area - the floor bed is concreted up to the installation level of the reinforcing anchoring rod;
- downstream head - the floor bed is concreted up to 43.25 mdMB.

For the HN4 of Copăceni, in the area above the water level that flooded the construction premises, the concrete laid in the dam, power plant and lock has segregated or burred areas. Deeper segregated areas were observed in the bottom discharge conduits area of the hydropower plant in the separating piers (up to 20 cm deep), thus revealing the vertically arranged reinforcing bars.

Traces of vandalism were found, consisting of:

- cutting the vertical reinforcement strings on all objects to be executed;

- cutting the sheeting of the bottom discharge conduits located under the mounting block, designed for the discharge of storm flows;
- cutting the PVC sealing strips which were in plain view.

At all nodes, the measuring and testing apparatus embedded in the concrete or on the foundation plate was destroyed.

On the Argeș river - due to the danger of floods following the abandonment of the works at the end of 1989 by Government Decision No. 784/1994 it was foreseen that the Mihăilești reservoir should be built with a retention of 4 m lower than the initial one, and the canal coming from HN5 to the Argeș canal was considered as a regularisation work downstream the reservoir falling under the 3rd class of importance (from the 2nd class). At present, the Mihăilești reservoir, the former HN5 and the downstream regularisation are under the administration of the Romanian water management authority (ANAR) - Argeș-Vedea Water Basin Administration.

2.3.2. Proposed works

Tables 7 to 9 summarise the technical characteristics of the designed works.

Table no. 7 - New dams on the Argeș river

No.	Work	MU	Length	Area	Volume	County/Locality
Reach 0 (km 0+000 - km 2+282)	**Embankments**					Municipality of Oltenița; **County of Călărași:** Chirnogi commune
	Topsoil removal	m2		706		
	Dredging	m3			1058470.00	
	Excavations	100 m3			10,584.70	
	Filling in dikes	100 m3			2,738.40	
	Topsoil and grass cover	100 m2		396.90		
	Excavation of premises pier ditch	m3			15820.00	
	Construction works					
	Flexible mattress made of bit. slabs	100 m2		396.90		
	Geotextile filter	100 m2		1575.70		
	Rubble stone rockfills	100 mc			694.40	
	Rubble stone prism at the base of the prefabricated slab revetment	100 mc			360.50	
	Drainage material (drainage cushions and mattresses)	100 m2		444.50		
	Simple concrete beam	m3			2530.50	
	Soil-filled concrete patterns	100 m2		444.50		
(km 2+282 -	**Embankments**					Municipality of Oltenița;
	Topsoil removal	100 m2		84704.16		

No.	Work	MU	Length	Area	Volume	County/Locality
	Dredging	m3			3101832.50	**County of Călărași:** Commune of Chirnogi; Commune of Clătești; Commune of Mitreni; Commune of Curcani; Commune of Radovanu; Commune of Șoldanu; Commune of Crivăț
	Excavations	100 mc			31018.33	
	Filling in dikes	100 mc			115650.60	
	Topsoil and grass cover	100 m2		12,420.85		
	Construction works					
	Flexible mattress made of concrete slabs	100 m2		10827.70		
	Geotextile filter	100 m2		11924.90		
	Rubble stone rockfills	100 mc			1766.70	
	Rubble stone prism	100 mc			44.85	
	60 cm walls	100 m2		1337.70		
	Wall head beam	m3			31590.00	
	Drainage material (drainage cushions and mattresses)	100 m2			8171.15	
	Flexible blocks of concrete slabs under the shore protection	m2		10827.70		
	Ballast drainage layer under the monolithic concrete revetment	100 m2		8171.15		
	Waterproof protection with monolithic reinforced concrete revetment	100 m2		8171.15		
	Geotextile filter	100 m2		11924.90		
	Front drainage - excavation of premises pier ditch	m3			386747.40	
	Collector channel	m		50376.00		
	Concrete demolition	m3			20.00	
Reach 2 (km 28+351-53+609)	**Embankments**					Municipality of Oltenița; **County of Călărași:** Commune of Budești; Commune of Crivat; **County of Giurgiu:** Commune of
	Topsoil removal	100 mc			3624.08	
	Dredging	m3			40529.78	
	Excavations	100 mc			40529.78	
	Filling in dikes	100 m3			16,087.50	
	Topsoil and grass cover	100 m2		5,265.00		
	Construction works					

No.	Work	MU	Length	Area	Volume	County/Locality
	Flexible mattress made of concrete slabs	100 m2		5642.51		Hotarele; Commune of Izvoarele; Commune of Teiușu; Commune of Mironești; Commune of Gostinari
	Geotextile filter	100 m2		5767.05		
	Rubble stone rockfills	100 mc			1749.34	
	60 cm walls	100 mc		751.22		
	Wall head beam	100 mc		155.81		
	Drainage material (drainage cushions and mattresses)	100 mc			5911.84	
	Monolithic reinforced concrete slabs at the base of the impermeable revetment	100 m2		4932.89		
	Waterproof protection with monolithic reinforced concrete revetment	100 m2		1476.63		
	Bitumen joint sealing	100 m2		147.75		
	Precast concrete slabs (2.50x1.50x0.10) m	m2		1476.63		
	Reverse filter under permeable revetment	100 m2		5419.79		
	Simple concrete beam	m3			24389.30	
	Topsoil-filled concrete patterns	100 m2		1137.50		
	Front drain	100 lm	326.61			
	Collector channel	100 mc			1695.24	
	Concrete demolition	m3			30.00	
Reach 3 (km 53+609 - km 63+134)	**Embankments**					**County of Giurgiu:** Commune of Colibași; Commune of Falaștoaca, Commune of Grădiștea, Commune of Mogoșești
	Topsoil removal	100 m2		290.00	221.77	
	Excavations	100 mc			12668.27	
	Filling in dikes	100 m3			3,274.56	
	Topsoil and grass cover	100 m2		665.32		
	Construction works					
	Flexible mattress made of concrete slabs	100 m2		3635.00		
	Geotextile filter	100 m2		3719.00		
	Rubble stone rockfills	100 mc			2314.00	
	60 cm walls	100		64643.		

No.	Work	MU	Length	Area	Volume	County/Locality
		m2		00		
	Wall head beam	100 mc			5746.00	
	Drainage material (drainage cushions and mattresses)	100 mc			711.00	
	Monolithic reinforced concrete slabs at the base of the impermeable revetment	100 m2		180.00		
	Waterproof protection with monolithic reinforced concrete revetment	100 m2		946.00		
	Gravel drainage layer for impermeable revetment	100 m2		647.00		
	Permeable protection with revetment made of prefabricated reverse filter slabs	100 m2		281.00		
	Reverse filter under permeable revetment	100 m2		281.00		
	Bitumen joint sealing	100 m2		279.00		
	Simple concrete beam	100 mc			52.00	
	Topsoil-filled concrete patterns	100 m2		353.00		
	Front drain	100 lm	120.00			
	Collector channel	100 m3			63.00	
	Concrete demolition	m3			50.00	
Reach 4 (km 63+134 - km 73+424)	**Embankments**					**County of Giurgiu:** Commune of Varlaam; **County of Ilfov:** Commune of Copaceni; Commune of Adunații Copăceni; Commune of 1 Decembrie; Commune of Dărăști Vlașca; Commune
	Topsoil removal	100 m3		9.45		
	Dredging	100 m3			22648.74	
	Excavations	100 m3			1,356.39	
	Filling in dikes	100 m2		1,889.15		
	Topsoil and grass cover					
	Construction works					
	Flexible mattress made of concrete slabs	100 m2		2,961.18		
	Geotextile filter	100 m2		3075.17		
	Rubble stone rockfills	100 m3			3243.93	
	60 cm walls	100		2867.8		

No.	Work	MU	Length	Area	Volume	County/Locality
		m2		7		of Dărăști - Ilfov
	Wall head beam	100 m3			79.25	
	Drainage material (drainage cushions and mattresses)	100 m3			575.88	
	Monolithic reinforced concrete slabs at the base of the impermeable revetment	100 m2		240.25		
	Waterproof protection with monolithic reinforced concrete revetment	100 m2		2059.54		
	Gravel drainage layer for impermeable revetment	100 m2		1664.66		
	Permeable protection with reverse filter prefabricated slab revetment	100 m2		650.27		
	Reverse filter under permeable revetment	100 m2		650.27		
	Bitumen joint sealing	100 m2		615.87		
	Simple concrete beam	100 m3			23.92	
	Topsoil-filled concrete patterns	100 m2		62.36		
	Front drain	100 lm	116.87			
	Collector channel	100 m3		61.36		
	Concrete demolition	m3			100.00	
Reach 5 - Regularisation sector (km 73+424 - km 82+918)	**Embankments**					**County of Ilfov:** Commune of Dărăști Ilfov; Commune of Dumitrana; Commune of Măgurele
	Topsoil removal	100 m3			3471.60	
	Dredging excavations	100 m3			11536.80	
	Local fill for dykes	100 m3			6,334.20	
	Topsoil and grass cover	100 m2		750.00		
	Construction works					
	Rubble stone prism at the base of the bank protection	100 m3			4104.60	
	Flexible mattress made of concrete slabs	100 m2		2205.00		
	Geotextile filter	100 m2		3497.40		
	Lightweight protection with topsoil-filled concrete patterns	100 m2		318.00		
	Simple concrete beam	m3			6120.00	

Table no. 8 - New dams on the Dâmbovița river

No.	Work	MU	Length	Area	Volume	County/Locality
Reach 1 (km 0+000 - km 15+128)	**Embankments**					**County of Călărași:** Communes of Budești, Vasilați, Gălbinași, Plătărești
	Topsoil removal	100 m3		706	6388.8	
	Excavations	100 m3			10598.40	
	Filling in dikes	100 m3			55,546.40	
	In-bed fill from excavations	100 m3			6110.40	
	Topsoil and grass cover	100 m2		5,536.80		
	Fillers in the cut-off wall platform	100 m3			5,562.40	
	Excavations for the cut-off wall platform	100 m3			7,772.00	
	Excavation of premises pier ditch	m3			98250.40	
	Construction works					
	Cut-off wall	100 m2		5803.20		
	Concrete foot walls	100 m2		398.40		
	Geotextile mattress with fascia pattern	100 m2		2887.20		
	Protection made of unsorted stone	m3			149565.00	
	Revetment bearing beam	m3			7986.40	
	Ballast drainage layer	100 m2		4792.80		
	Geotextile	100 m2		4792.80		
	Reinforced concrete revetment, thickness = 15cm	100 m2		4792.80		
	Bulwark	100 m	242.40			
	Dyke foot drain	100 m	242.40	1,575.70		
	Ballast draining mattress	100 m2		2515.20		
	Bitumen joint sealing	100 m2		4792.80	360.50	
	Ditch concrete	m3			14520.00	
	Reinforcement	tons			1,016.80	
	Formwork	100 m2		44.00		
	Geotextile	100 m2		1394.40		
Reach 2 (km 15+128 - km 23+353)	**Embankments**					**County of Călărași:** Communes of Plătărești; Fundeni; **County of Ilfov:** Commune of Cernica**;**
	Topsoil removal	100 m2		11392.00		
	Excavations	100 m3			27267.20	
	Filling in dikes	100 m3			2,477.60	
	In-bed fill from excavations	100 m3			872.00	
	Topsoil and grass cover	100 m2		376.80		

No.	Work	MU	Length	Area	Volume	County/Locality
	Fillers in the cut-off wall platform	100 m3			497.60	
	Foot wall platform excavations	100 m3			12,414.40	
	Excavation of premises pier ditch	m3			195595.20	
	Construction works					
	Concrete foot walls	100 m2		531.20		
	Cut-off wall	100 m2		201.60		
	Geotextile mattress with fascia pattern	100 m2		1,575.84		
	Protection made of unsorted stone	100 m3			93127.20	
	Revetment bearing beam	m	4556.00			
	Ballast drainage layer	100 m2		1200.00		
	Geotextile	100 m2		1224.00		
	Bulwark	100 m	91.20			
	Dyke foot drain	100 m	31.20			
	Ballast draining mattress	100 m2		98.40		
	Bitumen joint sealing	100 m2		1200.00		
	Ditch concrete	m3			5973.60	
	Reinforcement	tons			418.40	
	Formwork	100 m2		18.40		
	Geotextile	100 m2		70.40		
	Anti-erosion protection (geogrid + geotextile)	100 m2		768.80		
	Drainage channels on reinforced concrete slopes	pcs.			8.00	
	Reinforced concrete C35/45 in retaining wall and parapet for wave deflector	m3			17680.00	
	Concrete formwork for retaining walls	100 m2		352.00		
	BST500 s reinforcements for retaining wall	tons			2,121.60	
	Bored piles f=600mm, L=20.00m	pcs.			992.00	
	C12/15 simple levelling concrete	m3			1028.80	
	WALLS MADE USING A KELLY BAR 60 cm THICK, 20.00 m LONG	100 m2		280.00		
Reach 3 (km	**Embankments**					**County of Ilfov:** Commune of Cernica and
	Topsoil removal	100 m3			421.00	
	Excavation works for side ditch	m3			56072.00	

No.	Work	MU	Length	Area	Volume	County/Locality
	Construction works					Commune of Glina
	Geotextile mattress with fascia pattern	100 m2		140.00		
	Protection made of unsorted stone in the river bed - procurement	m3			13872.00	
	Removal of degraded slabs - 15 cm thick	100 m2		195.00		
	Repair of reinforced concrete revetment slabs - 15 cm thick.	100 m3		751.22		
	Bulwark restoration works	100 m	7.30			
	Repairs of sealing joints	100 m3		1943.00		
	Gutter concrete	m3			8762.00	
	Reinforcement	tons			613.34	
	Gutter concrete formwork	100 m2		26.29		
	Geotextile	100 m2		842.00		

Table No. 9 - Other new works provided for in the project

No.	Work	Area (m2)	County/Locality
1.	Rail link to the port of 1 Decembrie	82000	1 Decembrie/Ilfov
2.	Road access to the port of 1 Decembrie	19683	
3.	Road access to DN4 National Road - Budesti - Dâmbovița	4000	Budești/Călărași
4.	Crossing over DN4 national road at Budești km 1+093- Dâmbovița	21000	
5.	Crossing over DJ 301 County Road Budești-Crivat	24160	
6.	HN 2 Budești	20000	
7.	Road access for HN2 - Argeș river	9000	
8.	Road access for HN3 - Argeș river	4500	Colibași/Giurgiu
9.	HN 3 if Colibași	18750	
10.	Road access for HN4 - Argeș river	9900	Copăceni/Ilfov
11.	HN 4 Copăceni	17500	County of Giurgiu/Adunații Copăceni
12.	Civil engineering works for the port of 1 Decembrie	1570	1 Decembrie/Ilfov
13.	Railway link to the port of Oltenița	17000	Oltenița/Călărași
14.	Road access to the port of Oltenița	31500	
15.	Civil engineering works for the port of Oltenița	1270	
16.	HN 1 Oltenița	20000	
17.	Road access for HN1 - Argeș river	7650	
18.	Road access for HN of Tânganu - Dâmbovița river	15200	Fundeni/Ilfov
19.	Road access to Fundeni-Pițigaia - Dâmbovița	3120	

No.	Work	Area (m2)	County/Locality
20.	HN 1 Tânganu	12000	
21.	Road access to Cernica-Bălăceanca - Dâmbovița	7200	Cernica/Ilfov
22.	Crossing over DC55 local road Cernica-Bălăceanca km 25+713 - Dâmbovița	8800	
23.	Crossing over DJ 100 county road Fundeni-Pițigaia km 20+472 - Dâmbovița	8320	Fundeni/Ilfov
24.	Rail link to the port of Glina	21000	Glina/Ilfov
25.	Road access to the port of Glina	2250	
26.	Civil engineering works for the port of Glina	1233	
27.	Dâmbovița water pipeline under crossing	475	
28.	Dâmbovița gas pipeline under crossing	360	
29.	Road access to Vasilați-Nuci/ Dâmbovița	6800	Vasilați/Călărași
30.	Crossing over DJ412 county road Vasilați-Nuci - Dâmbovița	10800	
31.	HN 2 of Cucuieți	22000	Plătărești/Călărași
32.	Road access for HN 2 of Cucuieți - Dâmbovița river	6400	
33.	Access roads to the wave crest on Argeș river	12.8000	Counties of Ilfov, Giurgiu and Călărași
34.	Emergency roads in Argeș	1.68.400	
35.	Emergency roads in Dâmbovița	607280	Counties of Ilfov and Călărași

2.3.2.1 Description of designed works on the Argeș river

2.3.2.1.1 Main characteristics of the planned river control works on the Argeș river

The documentation drawn up and the works carried out between 1986 and 1990 (1994) concerned the lower course of the Argeș River in the section between the railway bridge over the Bucharest - Craiova railway line and the Danube, in a length of approx. 95 km.

Starting from the Danube, the course of the Argeș river was to be navigable up to the port of Bucharest - 1 Decembrie, over a length of approx. 73 kilometres. Further upstream, it was planned to embank the river up to the dam of the lake of Mihăilești - Cornetu, on a length of approx. 10 km, thus ensuring the protection of neighbouring localities and land from flooding. Behind this dam, a reservoir was planned and realised, which is approx. 11.8 km long, up to the railway bridge at Grădinari.

The reservoir of Mihăilești - Cornetu was completed, with reduced parameters compared to the initial documentation, and is currently exploited by the Romanian Waters Administration - Argeș - Vedea Water Management Directorate.

The present documentation considers the course of the Argeș River on the section between the Danube (km 0+000) and the dam of Mihăilești - Cornetu lake (km 83+041), with the port of Bucharest being located at km 73+000. The connection of the sector developed for navigation with the bed of the natural - dammed course of the river was made by a bottom sill located at km 73+465, which connects the navigable sector to the upstream dammed area. On this sector the thalweg is maintained at the current level up to the dam of the Mihăilești - Cornetu reservoir (km 83+052).

In variant 1, the navigable fairway up to the bottom sill is 73.423 km long. There are 52 bends on this route, 23 of which have radii of 1,000 metres and greater, and 29 bends have radii of 750, 800 and 850 metres.

In variant 2 the navigable fairway has 45 bends, of which 22 have radii of 750, 800 and 850 metres, and 23 bends have radii of 1000 metres and greater. On the section upstream of the bottom sill from km 73+289 up to the Mihăilești - Cornetu reservoir dam (km 82+918), the planned control works are identical to those of variant 1.

In the regularised area, between the bottom sill at km 73+289 and the dam of the Mihăilești - Cornetu reservoir (km 82+918), the left bank dam, which protects 4 human settlements, was designed to ensure 1% exceedance probability, while the dam on the right bank, where there are no settlements and the high river terrace is close to the river course, was designed to provide 5% exceedance probability. In order to prevent flooding of the area downstream of km 73+289 on the right bank, in the event of floods exceeding the protection considered, a closing dike with the same exceedance probability as the longitudinal dike has been provided from the sill at km 73+289 to the high terrace bordering the right bank of the development.

The inner slopes are provided with protection, defence and reinforcement works. Their type was chosen according to the demands they are subjected to and the water level, with the aim of significantly minimising seepage from the development section and protecting adjacent land.

When the normal retention level (NRL) in each individual reach is less than 1.00 m above the general level of the surrounding land, the inner slope of the section will be protected with a concrete impermeable revetment up to the water level with a 1% exceedance probability.

If the difference in level between the water level with 1% exceedance probability and the NRL is less than 1.0 m, the slope protection will be defended up to the NRL height + 1.00 m (wave defences with wave runup).

At the bottom the slope protection is extended in depth as shown below:

- When the normal retention level (NRL) of the respective reach is between -1.0 m and +1.0 m above the general level of the adjacent land, the project provides thin walls/diaphragms of bentonite slurry with a thickness of about 10 cm and a depth of 8.0-10.0 m.

- When the normal retention level (NRL) in the reach is between +1.0 m and +3.0 m above the general level of the adjacent land, the project provides a 40 cm thick concrete cut-off wall made of bentonite slurry and embedded 1.0 m into the impervious clay or marl layer. The maximum depth of this type of wall is 25 metres. If no impervious layers have been found up to this depth, the wall remains floating.

- If the normal retention level (NRL) in the reach is higher than +3.0 m above the general level of the adjacent land, the project provides the construction of 60 cm thick concrete cut-off walls made of bentonite slurry, embedded 1.0 m into impervious layers. The depth of this type of cut-off wall is up to 35.0 metres. If no impervious layers have been found up to this depth, the walls stop at 35.0 m.

When the normal retention level (NRL) in the reach is lower than -1.0 m from the general level of the adjacent land, the inner slope of the section is protected against the action of waves and wind by means of construction solutions with pervious works (raw stone on filter layers, precast concrete slabs or cast-in-place concrete, with weepers placed at a distance of approx. 1.0 ... 1.5 m). Such works will be carried out up to the water level with an 1% exceedance probability or at least NRL + the height of the navigation wave (NRL + 1.0 m). Above the water level with a 1% exceedance probability of the inner slopes is of the light type (cores made of prefabricated elements filled with topsoil, grassed).

The control works on the lower course of the Argeş River for navigation consist of levelling the river in plane in order to allow the access of convoys formed by a barge and the corresponding pusher, as well as its levelling and its sectioning by 4 steps that take over the difference in level of about 53 m between the Argeș water level in the area of the port of Bucharest and the confluence with the Danube.

Each step forms a hydrotechnical node composed of the following construction works:

- Concrete weir for high-volume water discharge;
- Hydroelectric power plant;
- Locks.

2.3.2.1.2 Meanders of the Argeș canal

In the recommended variant - Variant no. 2, the minor riverbed route leaves the old meandering route of the Argeș river, due to the navigation conditions imposed by the Pianc Regulation which recommends larger radii of the bends for safe navigation in both directions.

Therefore, the minor bed moves outside the meander and deepens to the designed level of the fairway. The areas of the major riverbed adjacent to the meander will also be cleared in order to create small bays to shelter ships along the Argeș canal.

So the cleared meanders/old deserted river branches are kept within the major riverbed in route variant 2. A minor bed has been realised to close the meanders, which remain included in the major bed.

This has been done in such a way that the flow equilibrium is disturbed to a very small extent and the additional quantities of silt set in motion by the regularisation works are small.

These areas between the centreline of the riverbed and the meanders will be cleared as far inland as the protection zone of the dikes.

In the area of the minor riverbed, the navigable fairway of the Argeș canal is being built, so it is necessary to deepen the canal up to 1m above the level established by the project.

- Thalweg elevation = 19.67 mMN75
- Excavation elevation = 20.67 mMN75.

2.3.2.1.3 Characteristics of the fairway

- length of navigable waterway between the Danube and the Port of Bucharest - 1 Decembrie 73 km
- minimum width at the base of the fairway section, set to allow flood wave transit 80 m
- minimum water depth 4.5 m
- minimum radius
  - normal 1000 m
  - exceptional 750 m
- air clearance above water level at the normal retention level (NRL) 11.0 m.

Materials used for canal waterproofing

There are two types of slope sealing works on navigable canals:

- depth works such as cut-off walls
- wet slope protection works, both for dams and embankments made in excavation.

Argeș river

❖ *Cut-off walls*

Their purpose is to reduce the flow of seepage under the foundations of dams or the impervious concrete protection of slopes in excavations.

The location of the works is in the Argeș meadow on a succession of alluvial layers with variable permeability, without continuity, consisting of soils of various types, such as clays, dust, sands, gravels, etc., and it requires the execution of cut-off walls at the waterward foot of the dykes. The role of the walls is therefore to ensure hydrodynamic stability and to control the seepage flows in the channel, together with the drainage system located at the outer foot of the dykes.

On the Argeș River, three types of sealing systems (cut-offs) have been foreseen:

a) concrete cut-off wall embedded in the aquifer, located below the upper Colentina aquifer, made using a Kelly bar;

b) self-hardening slurry cut-off wall embedded in the aquifer, located under the upper layer of Colentina, made using a Kelly bar;

c) 5 m deep concrete cut-off wall, with the trench being excavated with a reverse bucket excavator.

The cut-off wall has the following two main functions:

- to ensure the hydrodynamic stability of the area at the waterward foot of the dikes;
- to control the seepage flows in the canal, in conjunction with the drainage system located adjacent to the inner slope of the dykes.

In relation to the application of the types of cut-off walls listed above:

• When the normal retention level (NRL) of the respective reach is between -1.0 m and +1.0 m above the general level of the adjacent land, the project provides thin walls/diaphragms of bentonite slurry with a thickness of about 10 cm and a depth of 8.0-10.0 m (type b).

• When the normal retention level (NRL) in the reach is between +1.0 m and +3.0 m above the general level of the adjacent land, the project provides a 40 cm thick concrete cut-off wall made of bentonite slurry and embedded 1.0 m into the impervious clay or marl layer. The maximum depth of this type of wall is 25 metres. If no impervious layers have been found up to this depth, the wall remains floating (type a).

• If the normal retention level (NRL) in the reach is higher than +3.0 m above the general level of the adjacent land, the project provides the construction of 60 cm thick concrete cut-off walls made of bentonite slurry, embedded 1.0 m into impervious layers. The depth of this type of cut-off wall is up to 35.0 metres. If no impervious layers have been found up to this depth, the walls stop at 35.0 m (type a).

When the normal retention level (NRL) in the reach is lower than -1.0 m from the general level of the adjacent terrain, type c is applied.

❖ *Slope protection works*

Depending on the location of the protections along the length of the reaches, two types of defence works can be differentiated on land (above the concrete beam):

- **Impervious protection** on downstream sections of canal pounds where there are cumulative retaining dikes with cut-off walls at their base. The purpose of the cut-off walls and impervious protections is to prevent water from passing through the dyke into the surrounding land that is lower than the level in the canal. **The impervious protection is made of a cast-in-place, weakly reinforced concrete revetment.** Expansion and contraction joints of monolithic slabs will be filled with bituminous mastic or Asrobit. Beneath this impermeable revetment, a drainage layer composed of ballast will be installed and linked at its lower end to the ballast cushion at the base of the dykes. The revetment is laid over the entire width of the slope from the concrete beam, which in these areas merges with the beam at the top of the cut-off walls, to the crest of the dams where it is connected to a 90 cm high prefabricated breakwater parapet. This parapet is 50 cm higher than the level of the platform on the crest of the dam.

Pervious protections

On upstream sections of canal pounds where there are cumulative retaining dikes with cut-off walls at their base. The pervious protection is realised by a revetment made of rectangular slabs of concrete with four holes on the contour. The slabs are rested on the concrete beam in rows of 3, 4 or 5 pieces per long side. Weepers are made at the joints.

2.3.2.1.4 Hydrotechnical Nodes on the Argeș River

A total of four hydrotechnical nodes have been designed along the Argeș River: HN1 Oltenița, HN2 Budești, HN3 Colibași (Gostinari), HN4 Copăceni (Varlaam).

Hydrotechnical nodes are equipped with:

- wasteway with 3 surface spillways at HN 1 and HN 2 and 2 spillways at HN 3 and HN 4 and bottom discharge conduits;
- twinned locks that ensure the transit of ships from one reach to another;
- power plant for processing available hydropower potential.

Wasteways are equipped with segment flap gates, measuring 10 x 5.75 m, (1.25 m flap height), as well as 2 bottom discharge conduits. At HN 1 and HN 2, the bottom discharge conduit valves are 5.50 x 3.30 m, and at HN 3 and HN 4, the valves are 4.50 x 3.0 m.

The dimensions of the locks are set in accordance with the dimensions of the 2000 tonne barge designed convoy, namely:

- net length of the lock chamber 130 m
- net width 2.50 m
- depth on sill 4.75 m.

When flows on the Argeș River exceed 500 m3/s, navigation ceases and the locks are used to evacuate the water inrush.

The dam steps at the 4 hydrotechnical nodes on the navigable sector have a drop, at a normal retention level, of 13 metres. They have a similar composition, with large wasteways, hydroelectric power plants and locks.

The waiting ports at the locks are 90 m wide, the length of the mooring structures is 130 m and the length of the routing structures is 120 m.

Wasteways have openings of 10 m. At the hydrotechnical nodes HN1 and HN2, after the Argeș receives as tributaries the rivers Neajlov, Sabar and Dâmbovița, they have 3 openings each, and at the nodes HN3 and HN4, located upstream of these tributaries, 2 openings each. Wasteways are fitted with identical hydromechanical equipment.

The hydropower plants are located in the 4 hydrotechnical nodes, between wasteways and locks and have an installed capacity of 4 x 5.70 MW = 22.80 MW. They ensure an energy production of 58.20 GWh/year in years with average rainfall.

The locks are twinned. They are identical and sized in accordance with the size of the designed convoy, namely:

- net length of the lock chamber 130.00 m;
- total length 177.00 m;
- net width of the lock chamber 12.50 m;
- minimum water depth at the sill of the lock 4.75 m.

Outports of locks were made of prefabricated reinforced concrete spatial elements founded on drilled columns.

2.3.2.1.5 Solutions adopted for the river control works carried out on the Argeș river

Navigational improvements consist of regularising the course of the river in plane, diking and damming it and sectioning it by means of steps (hydrotechnical nodes).

Upstream of the port of Bucharest - 1 Decembrie, a bottom sill has been planned at km 73+465, linking the navigable sector with the upstream dammed area. On this sector the thalweg is maintained at the current level up to the dam of the Mihăilești - Cornetu reservoir (km 83+043).

The route of the planned fairway on the Argeș river was established taking into account the requirements of PIANC WG 20-2006. The minimum alignment between curves was intended to be greater than 214 m - in the case of curves in the same direction and greater than 320 m in the case of curves in the opposite direction. This ensures normal, unrestricted manoeuvrability of the designed convoy.

2.3.2.1.6 Longitudinal profile

For the Argeș river, a large number of studies have been carried out on the number of dam steps and the fall head at each step and their location. The studies showed that it was appropriate to create 4 dam steps on the navigable section of the river with a fall head of 13.0 m at the normal retention level.

Dam steps are designed in the form of hydrotechnical nodes located as follows:

- hydrotechnical node HN 1 of Oltenița - ensures the linking to the Danube levels
- hydrotechnical node HN 2 of Budești - immediately upstream of the current confluence Dâmbovița - Argeș;
- hydrotechnical node HN 3 of Colibași - upstream the confluence Neajlov - Argeș;
- hydrotechnical node HN 4 of Copăceni/Varlam.

The hydrotechnical nodes together with the bottom sill at km 73+465 delimit a number of 5 reaches on the lower course of the Argeș. The five reaches of the planned control works on the Argeș River are delimited according to the following table:

CANAL POND	**Sector**	**Km**
Reach "0" (between the Danube and HN1 Oltenița)	navigable	0+000 ÷ 2+282
Reach 1 (between HN1 of Oltenița and HN2 of Budești)		2+282 ÷ 28+351
Reach 2 (between HN2 of Budești and HN3 of Colibași)		28+351 ÷ 53+475
Reach 3 (between HN3 Colibași and HN4 Copăceni (Varlam)		53+475 ÷ 63+000
Reach 4 (between HN4 of Copăceni Varlam and bottom sill)		63+000 ÷ 73+289
Reach 5 (between the bottom sill and the Mihăilești dam)	controlled	73+289 ÷ 82+918

The length of each reach, taking into account the works related to the hydrotechnical nodes, is given in the following table:

CANAL POND	**Sector**	**Length in m**
Reach "0" (between the Danube and HN1 Oltenița)	navigable	2097
Reach 1 (between HN1 of Oltenița and HN2 of Budești)		25869
Reach 2 (between HN2 of Budești and HN3 of Colibași)		24939
Reach 3 (between HN3 Colibași and HN4 Copăceni (Varlam)		9340
Reach 4 (between HN4 of Copăceni Varlam and bottom sill)	navigable	10274
Total length of the navigable sector (including hydrotechnical nodes)		73289
Reach 5 (between the bottom sill and the Mihăilești dam)	controlled	9629
Total length of the controlled sector (Mihăilești dam - bottom		9629

CANAL POND	Sector	Length in m
sill)		
TOTAL LENGTH OF CONTROL WORKS ON ARGEȘ RIVER		**82918**

2.3.2.1.7 Cross-sectional profile

The cross-section of the planned control works on the Argeș river has a trapezoidal shape with a minimum width of 80 m at the base, determined for the purpose of evacuation of floods.

The minimum water depth in the navigable fairway in relation to the normal retention level in each reach is 4.50 metres. In the reach "0" - between the Danube and the Oltenița hydrotechnical node (HN1) the level of the constructed bottom is +6.50 mrMB compared to the level of the Danube's low water level (+10 mrMB). As a result, the 2,000-tonne barge can navigate the Danube at low levels in the reach "0", when the guaranteed depths on the unimproved river are 2.50 m, compared with 3.50 m in the reach "0".

2.3.2.2 Description of designed works on the Dâmbovița river

2.3.2.2.1 Main characteristics of the planned river control works on the Dâmbovița river

The works to make the Dâmbovița river navigable are aimed at canalising, damming and diverting the river's course in the sector between the road bridge crossing the river at Glina and its confluence with the Argeș river at Budești

The length of the Dâmbovița waterway between Glina and Budești is 31 km.

The hydrotechnical scheme of the Dâmbovița river development is intended to take over the 14.60 m difference in level between the water level at Glina and the level in the reach Argeș 2, formed behind the hydrotechnical node HN2 at Budești (elevation +37 mrMB). This difference in level is taken up by the 2 hydrotechnical nodes of Tânganu and Cucuieți.

The waterway on the Dâmbovița and its related constructions took into account the designed convoy consisting of a barge with a capacity of 1,500 tonnes and its pusher.

2.3.2.2.2 Characteristics of the fairway

- the length of the waterway between the port of Bucharest - Glina and the confluence with the Argeș river, upstream of HN2 of Budești, is 31 km;
- minimum width at the bottom of the fairway 36 m;
- minimum water depth at NRL 4.0 m;
- minimum radius
  - normal 1000 m
  - exceptional 750 m;
- air clearance, above the maximum water level at NRL 11.0 m.

As in the case of the Argeș river, sealing works (impervious works) such as depth cut-off walls and impermeable revetments are also envisaged for the Dâmbovița canal.

There are three types of **cut-off walls**:

- self-hardening slurry cut-off walls
- walls made of bentonite slurry
- concrete cut-off walls made using a Kelly bar (or alternatively, the solution with a cut-off wall made of perforated secant piles may be adopted, as this type of cut-off wall is applied strictly on the section with a changed route (elbow cut)).

Slope protection on dykes and banks in excavation

All along the waterway, with the exception of the changed section, the protection of the wetted slope, both at the dykes and in the case of the excavated slope, was ensured with **a 15 cm thick reinforced concrete impermeable revetment**.

On the changed section (elbow cut), the impervious protection on the navigation section consists of a reinforced concrete retaining wall founded on drilled piles.

2.3.2.2.3 Hydrotechnical nodes on the Dâmbovița river

Two hydrotechnical nodes have been designed on the Dâmbovița river: HN 1 of Cucuieti, HN2 of Tanganu.

The hydrotechnical nodes designed on the Dâmbovița river at Tânganu and Cucuieți consist of:

- wasteway;
- simple lock;
- hydroelectric power plant.

The wasteways at each location have 3 spillway fields 8 m wide, equipped with 8 x 3.5 x 3 m tainer gates.

The lock has a net length of 130 metres, a lock chamber width of 12.50 metres and a sill depth of 4.75 metres. The dimensions of the lock are compatible and allow the navigation of a convoy consisting of a 2,000 tonne barge and its pusher.

The lock waiting ports are provided on the left bank, are 130 m long, and the routing constructions are 105 m long. On the right side, there are 60 m long routing constructions.

The hydroelectric power plants designed in each of the two hydrotechnical nodes have equipping characteristics according to the following table:

No.	***Name of the hydrotechnical node (HN)***	***Number of power groups***	***Gross head (m)***	***Utilisable discharge (m^3/s)***	***Installed capacity (MW)***	***Em (GWh/year on average)***
1.	HPP HN_1 - Cucuieți	2	7.30	24	1.41	8.04
2.	HPP HN2 Tânganu	2	7.30	24	1.41	8.56
	Total		**14.60**		**2.82**	**16.60**

The dam steps at the hydrotechnical nodes of Tânganu and Cucuieți have a head of 7.30 metres at normal retention level. They have wasteways, locks and hydroelectric power plants.

The wasteways have 3 spans of 8 metres, and the locks are simple and have similar characteristics to those designed for the Argeș River.

The port of Bucharest-Glina has a basin and platforms located on the left bank of the river, in front of the Bucharest wastewater treatment plant.

2.3.2.2.4 Designed works on the Dâmbovița river

The navigable fairway of the Dâmbovița river separates from the Argeș canal, which is located immediately upstream of the lock's outport in the hydrotechnical node HN2 of Budești (km 29+710).

The designed route took into account the guidelines recommended by the PIANC WG 20 Working Group.

The characteristic elements of the reach designed on the Dâmbovița River are listed in the following table:

Reach	Kilometre position
Reach 1 between km 0+000 (confluence with the Argeș river) and HN of Cucuieți	0+000 – 15+128
Reach 2 between HN of Cucuieți and HN of Tânganu	15+128 – 23+353
Reach 3 between HN of Tânganu and the bridge on the capital's ring road	23+353 – 30+485

The lengths of the reaches are listed in the following table:

Reach	Length in m
Reach 1 (confluence with Argeș river) - HN of Cucuieți	14948
Reach 2 HN of Cucuieți - HN of Tânganu	8035
Reach 3 HN of Tânganu - bridge on the city's ring road	7122
Total length of the regularised/navigable sector	**30485**

2.3.2.2.5 Longitudinal profile

The longitudinal profile and the hydrotechnical scheme for the planned control works on the Dâmbovița river take into account the fact that the hydrotechnical node of Tânganu is at an advanced stage of implementation.

The damming steps, namely the hydrotechnical nodes of Cucuieți and Tânganu, take over the difference in level of 14.60 m between the normal retention level downstream of the HN of Glina, namely the area of the port of Bucharest - Glina and the normal retention level on the Argeș river, in the confluence area of Dâmbovița - Argeș rivers.

2.3.2.2.6 Cross-section

The designed cross-section of the Dâmbovița river has a trapezoidal shape.

The minimum width at the base is 40 metres, determined by considerations of normal two-way vessel traffic (WG 20 - PIANC Guidelines).

The minimum water depth, at normal retention level, is 4.50 m to allow proper navigation of 2,000 tonne capacity barges.

The embankments have a slope of 1:3, and the dikes have a crest so chosen that the wave-breaker element mounted on the dike is not exceeded for flows on the Dâmbovița calculated with 0.1% exceedance probability.

2.3.2.3 The ports part of the river control works

Three operational ports have been designed along the Argeș and Dâmbovița rivers subject to control works:

- two ports related to the capital - one in the south-west of the municipality - on the Argeș river, called Bucharest - 1 Decembrie and another in the south-east, on the Dâmbovița river, called Bucharest - Glina;
- the port of Oltenița, situated at the confluence of the Argeș and Danube rivers.

Each port represents a complex of constructions and works consisting of: the port basin with operational berths, mooring structures, storage platforms, facilities serving operational processes, connections to land-based infrastructure, etc.

The locations of the capital's ports were selected based on extensive studies, taking into account the area's topographic-hydrographic and morphological features, proximity to the serviced objectives,

easy road and rail connections, and low construction and operating costs.

By the end of 1990, most of the port basins, quays and berthing docks, as well as the port platforms - and, in the case of the port of Bucharest – 1 Decembrie, also the road and rail access routes - had been completed.

2.3.2.3.1 Port of Bucharest - 1 Decembrie

The location of the Bucharest - 1 Decembrie port was chosen after examining 14 options. The chosen site is located on the Argeș river, in the area of km 72, with km 0 being at the separation of the waterway from the Danube.

The port is being developed with a lateral basin, which gives it obvious advantages in terms of operating conditions, the possibility of grouping operators in specialised sectors, optimal conditions for wintering ships and protecting them against ice and currents in river floods, etc.

It has operational quays with a length of 2,350 m, of which the vertical piers are 1,450 m long and the total length of the reinforced sloped quays is 900 m, 250 m on the upstream area - reserved for technical activities and 650 m on the downstream area, of which 450 m are allocated for barge convoy assembly/disassembly and waiting areas, and 200 meters reserved for tourism and passenger services.

The pile-supported quays have reinforced concrete superstructures (beam grids) founded on 584 bored reinforced concrete piles, each with a diameter of 1.10 meters and a length of 23.50 meters (totalling 584 columns), arranged in two rows. The transverse spacing between pile centres is 10.875 meters, and the longitudinal spacing along the quay is 5.0 meters.

The port platform is at +66.50 mrMB, while the bottom elevation of the port basin and fairway in the area is 58.50 m.

Throughout the length of the pile-supported operational quays, 16-tonne cranes or similar equipment will operate, along with corresponding platform machinery.

On both sides of the port basin, two railway lines are planned between the crane tracks.

The construction works planned for the port of Bucharest - 1 Decembrie platform include:

- a multifunctional building housing the Argeș–Dâmbovița waterway administration, river station, port administration, central dispatching service for navigation management on the whole system, quantitative and qualitative management of the system's waters;
- 28.5 square metre warehouse - built in 1988 on the southern platform of the basin;
- simple structures protecting technical installations such as potable and firefighting water systems, a ship waste reception and treatment station, a single-block wastewater treatment plant, an oil product separator, and a fuel tank;
- containers for operating activities (tool and spare parts storage, locker rooms with sanitary facilities, gate cabins).

Accessories for quay operations include: fenders on the beam faces, dead heads, metal access stairs, railway stops, cable ducts, and floating pontoons with metal gangways at each of the two reinforced sloped quays.

2.3.2.3.2 Port of Oltenița

Located at the confluence of the Argeș River and the Danube, the Port of Oltenița has operational fronts both on the left bank of the Argeș river in the confluence area and at the Danube, just downstream of the confluence.

The Danube sector features a 110-meter-long operational pile-supported operational quay with a substructure of bored reinforced concrete piles, each 1.50 meters in diameter. Downstream of this quay, a 120-meter-long solid waiting quay (reinforced sloped quay) has been designed.

The sector at the confluence with the Argeș river includes two operational quays with a total frontage of 200 meters, having substructures similar to the Danube quay. Upstream, on the left bank, a 100-meter-long reinforced waiting quay is developed. Additional waiting and barge convoy assembly/disassembly fronts are planned on the right bank of the Argeș river, within the protection of a routing mole built on the right bank. It should be noted that the waiting and barge convoy assembly/disassembly front on the right bank will be able to be extended up to approx. 700 metres, if necessary.

The port platform is at elevation +20.0 mrMB, considering the potential damming of the Danube at Călărași–Silistra and the comprehensive development of the river along its lower sector.

Due to the great height of the vertical pier, it was necessary to lay the pier foundation on 3 rows of reinforced concrete columns. The first row is 2.25 m landward of the quay crest line, the other 2 rows supporting a clearance of 10.875 m. The centre-to-centre spacing between pile centres along the quays is 7.50 meters. The reinforced concrete columns are 20 m long and embedded in bedrock. In total, 126 columns were executed for the port of Oltenița.

The berths on the right bank of the Argeș and the Danube rivers are linked by a circular mole, on the platform of which the necessary constructions to ensure the functionality of the port will be arranged.

The port infrastructure is in place, some repairs are still to be carried out to the works that have been neglected and degraded in the meantime. Quays need to be equipped with necessary accessories, and the port basin requires cleaning, dredging, and re-profiling.

The constructions that ensure the functionality of the port of Oltenița are located on the circular mole that connects the Danube and Argeș berths - left bank. These constructions are:

- a combined building housing the river station and operating group;
- simple structures protecting technical installations, and containers for certain operational activities in the port.

2.3.2.3.3 Port of Bucharest - Glina

The Port of Bucharest - Glina is the terminus of navigation on the Dâmbovița river. It is located just outside the railway line and Bucharest's ring road, on the left bank of the river, in front of the capital's wastewater treatment plant.

The port is developed by retreating the left bank of the Dâmbovița river by 136.5 m. The port basin has a trapezoidal shape. It includes three cargo-handling berths, one passenger berth, a waiting quay, and berths for bunkering and wastewater collection from vessels. The operational zone is built using a diaphragm wall solution executed with the Else rig, over a length of 345 meters, anchored with tie rods to bars installed using the Kelly drilling method. The lateral zones, where the passenger berth (on the western side), and the waiting and bunkering berths (on the eastern side) are located, have their slopes protected with reinforced concrete slab revetments.

The quays are fully completed, the next step is to finalise the operational platform at +55.00 mrMB with a width of 55 m, as well as the reinforced concrete running beams with foundations on drilled columns with a diameter of 1.18 m, arranged at a distance of 10.875 m interaxis in the direction of the crane track and 5.0 m interaxis along the quay.

The operational quay is planned to be equipped with three gantry cranes.

The platform includes road access and is connected to the railway system.

The construction works planned on the port platform include:

- a multifunctional building (housing the river station, port authority, navigation control on the Dâmbovița River, port dispatch centre, and the water management system for the Dâmbovița and its tributaries);

- simple structures for the protection of technical installations, such as the potable and firefighting water systems, monobloc wastewater treatment station, fuel storage tank, oil product separator, and a facility for the reception and treatment of ship-generated waste;
- containers for operational activities (tool storage, locker rooms - sanitary facilities, platform, gate cabins).

The Port of Bucharest - Glina will be equipped with the necessary operational installations and accessories, including floating pontoons for berthing at the reinforced sloped quay sections. The port basin will undergo cleaning, dredging, desilting, and re-profiling works.

How to supply navigable waterways to ensure discharge requirements

❖ ***Argeș Canal***

The general layout of the Argeș river (Danube - Bucharest canal) provides a total head of 53 m, between the water level at the port of 1 Decembrie (63.00 mdMB) and the Danube level (10.00 mdMB), which is taken over in 4 steps, as follows:

- HN1 - Oltenița (14.0 m);
- HN2 - Budești (13.0 m);
- HN3 - Colibași (13.0 m);
- HN4 - Copăceni (13.0 m).

The regulation of the discharges processed in the hydroelectric power plants of the hydrotechnical nodes and those necessary for navigation is carried out in the upstream dam of Mihăilești (HN5), which is in operation.

❖ ***Dâmbovița Canal***

- ***Hydrotechnical node of Cucuieți - Object 14***

The H.N. of Cucuieți is located at km 16 + 500, on the navigable canal of the Dâmboviţa river and consists of:

- wasteway;
- lock;
- hydroelectric power station on the right bank, Q i = 24 m3/s.

The Cucuieți spillway dam is designed to discharge the design flood plus 1% exceedance probability, with a flow of 260 m³/s through two openings, and to handle the verification flood for a discharge of 340 m3/s (0.1% exceedance probability).

The two locks at the Cucuieți and Tânganu hydrotechnical nodes were designed identically. The technical characteristics of HN of Cucuieți (overall sizes, dimensions of the upstream head, geometry of the upstream approach channel, lock chamber, downstream approach channel, and downstream head) are the same as for the HN of Tânganu.

The construction solutions and energy-economic parameters for the Cucuieți hydropower plant are identical to those of the Tânganu small hydropower plant (MPP), as the two nodes were designed to be functionally identical.

- ***Hydrotechnical node of Tânganu - Object 15***

The H.N. of Tânganu is located at km 24+725.00 and includes:

- wasteway, which was completed in 2010;
- lock;
- hydroelectric power station on the right bank, Q i = 24 m3/s.

The Tânganu navigable lock, located between the wasteway and the left bank, dimensioned for the

transit of the designed convoy consisting of 2000 tonne barges and their pushers. It was partially constructed and designed for a head of 7.30 meters, and includes:

- upstream head;
- upstream link zone;
- lock chamber;
- downstream link area;
- downstream head.

The functionality of these structures is ensured by a set of equipment and auxiliary installations.

The power plant is located on the right bank, with the spillway directed toward the left bank. The plant aligns upstream with the spillway dam via the intake block.

Level strictly necessary for navigation

Within the Argeș river navigation development, four hydrotechnical nodes (HN1-HN4) are designed, each with a dam-power plant and two twinned locks, identical in terms of mechanical equipment.

Levels and characteristic elevations upstream	NRL (mdMB)	24.00
Maximum navigation level (mdMB)	34.50	
Upstream threshold elevation (mdMB)	14.50	
Crest elevation (mdMB)	26.50	
Level Q5% (mdMB)	24.50	
Elevation of the lock chamber floor bed (mdMB)	6.50	
Downstream	NRL (mdMB)	10.50
Minimum navigation level (mdMB)	10.00	
Level Q5% (mdMB)	12.95	

- ***Argeș Canal***

	Upstream reach		**Downstream reach**
NRL	$\boldsymbol{Nmax.navig.}$		**NRL**
HN1	24.00	24.50	10.50
HN2	37.00	37.50	24.00
HN3	50.00	50.50	37.00
HN4	63.00	63.50	50.00

On the Dâmbovița river, the 2 locks at Tânganu and Cucuieți were designed identically.

Characteristic levels:

- upstream reach:
- NRL 44.30 mdMB;
- Max. navigation level 44.50 mdMB;
- Min. navigation level 44.30 mdMB;
- downstream reach:
- NRL 37.00 mdMB;
- Max. navigation level 37.70 mdMB.

Water levels in hydrotechnical nodes HN1 Tânganu - HN2 Cucuieți **Location**	**Upstream reach**	**Downstream reach**

NRL	$Nmax.navig.$		**NRL**	$Nmin.navig.$
HN1 of Tânganu	51.60	51.60	44.30	44.50
HN2 of Cucuieți	44.30	44.50	37.00	37.70

FUNCTIONAL DESCRIPTION

❖ ***Argeș Canal***

Flood discharges will be channelled through the structures of the hydrotechnical nodes as follows:

- discharges up to 500 m3/s (maximum navigable): ▪ HPP (Qi = 55 m3/s);
  - overflow weir;
  - the hydroelectric plant's bottom discharge conduits;
- discharges between 500 m3/s and the discharge with 5% exceedance probability (Q5%): ▪ the wasteways listed above
  - sluice inlet and outlet galleries (4 pieces x 9 m2 - Q = 240 m3/s);
- for higher discharges, when the discharge capacity of the spillway dam, the wasteways of the HPP, the lock inlet galleries and the upstream levels rise by 1.00 m above the NRL, the chambers of the two sluices are used as spillways.

Evacuation through the locks will be made by the stepped operation of the PSC flap gate from the upstream head with the flap in the raised position. Discharge is regulated to protect the downstream port.

The tables below show the discharge capacities for each of the spillways at upstream elevations ranging from 50 to 50 cm above NRL, and for downstream elevations on a per reach basis:

✓ **for HN1:**

Spillways			Discharge capacity - downstream 18.50 mdMB		
Upstream levels (NRL = 24.00 mdMB)					
24.00	24.50		25.00		25.50
1.	Overflow weir (3 fields)	630	750	870	990
2.	HPP galleries (2 galleries)	290	310	330	350
3.	Lock supply galleries (4 galleries)	190	200	205	215
4.	Locks (2 locks)	1210	1320	1460	1580
Total	2320	2580	2865		3135

✓ **for HN3 and HN 4:**

Spillways			Discharge capacity - downstream 18.50 mdMB		
HN3= 44.00 mdMB					
upstream elevations					
HN3 50.00	50.50		51.00		51.50
HN4 63.00	63.50		64.00		64.50
1.	Overflow weir (2 fields)	420	500	580	660
2.	HPP galleries (2 galleries)	260 / 310	270 / 320	280 / 330	290 / 340
3.	Lock supply galleries (4 galleries)	195 / 240	205 / 245	215 / 250	225 / 255
4.	Locks (2 locks)	1210	1320	1460	1580
Total	2035	2295	2335		2755

Overflow weirs ensure the downstream transit of large waters through the 2/3 spillway fields of the hydrotechnical nodes.

Discharges released beneath the weir gate, under partial openings (normal retention level –

upstream), for the opening "a" measured vertically between the gate's contact area with the structure face and the lower elevation of the gate's sealing edge, are:

a (m)	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
Q (m3/s)	16	30	45	57	71	84	97	106

The discharge capacity of the overflow weir for HN1 and HN2 (Studies regarding flood routing through the structures of the hydrotechnical nodes - 1988 stage, Ref ICH, June 1988), for free spill (three 10 m spillways), is:

Upstream level NRL + 0,5 m NRL + 1,0 m NRL + 1,5 m NRL + 1,5 m No. of openings

Discharge (m3/s) 630 750 870 990 3; 10.00; 5.75

For the overflow weirs at HN3 and HN4 (two spillways of 10 m each, by division), the result is:

Upstream level NRL + 0,5 m NRL + 1,0 m NRL + 1,5 m NRL + 1,5 m No. of openings

Discharge (m3/s) 420 500 580 660 2; 10.00; 5.75

The power plants provide the function of transit of floods in the hydrotechnical nodes through the 2 bottom discharge conduits of 5.50 x 3.30 square metres (4.50 x 3.00 square metres), located under the hydropower plant assembly platform.

Discharges from the power plant resulted from the model tests, as follows:

Discharges from the power plant resulted from the model tests, as follows: Δz (m)	4	5	6	7	8
Q (m3/s) HN1 and HN2	270	308	342	373	404
Q (m3/s) HN3 and HN4	200	229	254	277	300
Δz (m)	9	10	11	12	13
Q (m3/s) HN1 and HN2	435	465	495	525	556
Q (m3/s) HN3 and HN4	323	345	368	390	413

Locks provide the function of flood transit in hydrological nodes. The flows discharged under the tainer gate of a lock (at partial openings, a) are:

a (m)	0.25	0.50	0.75	1.00	1.25	1.50	1.75
Q (m3/s)	23	60	87	114	139	145	193
a (m)	2.00	2.25	2.50	2.75	3.00	3.25	3.50
Q (m3/s)	218	242	266	290	313	335	360

The kinetic term considered was (αv02 / 2g = 0.1 m).

It should also be noted that the discharges were calculated by averaging the values obtained on the models for the contact of the gate's sealing edge with the downstream face of maximum 0.5 m. In the present case, the difference is 2.25 m and the values presented could be higher by 7 ÷ 15 %.

For a fully lowered flap, for a lock and (Nflap = NRL - 4.75 m and m ε = 0.37), we have:

Upstream level	NRL + 2.0 m	NRL + +1.5 m	NRL + +1.0 m	NRL + +0.5 m	NRL
αv02 / 2g (m)	0.18	0.16	0.15	0.12	0.10
Discharge (m3/s)	390	350	310	270	235

Discharges through the locks at free spill (according to the Studies regarding flood routing through the structures of the hydrotechnical nodes - 1988 stage, Ref ICH, June 1988), are:

Upstream level	NRL	NRL + 0.5 m	NRL + 1.0 m	NRL + 1.5 m	NRL + 2.0 m
Discharge (m3/s)	1210	1320	1460	1580	1730

❖ ***Dâmbovița Canal***

The discharge of the design and verification floods (Q1%= 260 m/s, Q0,1%=340 mc3/s) is selected through all the structures of the Tânganu and Cucuieți hydrotechnical nodes (spillway of the wasteway, the discharge conduits from the power plant and even through the lock).

According to the recommendations of the Expert Note prepared in 1988, the locks will be used as spillways only at very low frequency discharges to protect the construction part, the hydromechanical equipment and the downstream floor bed of ports.

From the design stage it was envisaged that the locks would be used as wasteways to discharge part of the flood flows, together with the wasteways of the dams and the spillways under the power plant mounting block. Power dissipation will occur partially in the lock and in the downstream port of the locks.

For bottom dischargers at hydropower plants, the following have been analysed:

- how to equip them;
- the longitudinal profile of spillways.

The hydrotechnical node of Tânganu can safely ensure the pass of the design discharges (p = 1%) and verification discharges (p = 0.1%) corresponding to the class II of importance (STAS 4273 -83) in which it has been classified.

The hydrotechnical node of Cucuieți, according to the hydraulic simulation of the design conditions adapted to the entire development, can safely ensure the pass of the design discharges (p = 1%) and verification discharges (p = 0.1%) corresponding to the class II of importance (STAS 4273 -83) in which it has been classified.

It is also mentioned as a measure of reliability that the two hydrotechnical nodes also ensure the safe pass of the designed discharge (p= 2%) in case of blockage of a spillway.

The conditions and manoeuvres that will be included in the operating instructions will avoid water losses with an impact on navigation conditions and electricity production, while ensuring the safe operation of the entire installation, especially under high water conditions.

Also, the (designed) trained riverbed of the Dâmbovița river ensures the transit of discharges corresponding to class II of importance, namely the calculation discharge Q1% = 260 m3/s and the verification discharge Q0,1% = 340 m3/s.

The results of the simulations carried out in the area of the hydrotechnical nodes are as follows:

a. Hydrotechnical node of Tânganu

Operational scenario	**Level p = 1% upstream/downstream (mdM)**	**Level p = 0.1% upstream/downstream (mdM)**
Three spillways	51.74 / 45.25	51.97 / 45.74
Two spillways	52.12 / 45.47	-

b. Hydrotechnical node of Cucuieți

Operational scenario	**Level p = 1% upstream/downstream (mdM)**	**Level p = 0.1% upstream/downstream (mdM)**
Three spillways	44.40 / 38.15	44.61 / 39.00
Two spillways	44.79 / 38.15	-

In the case of a blocked overflow front, the maximum upstream/downstream levels recorded in the case of transit of the design discharge (Q1%=260 m3/s) are 52.12 / 45.47 mdMB at the HN of Tânganu and 44,79 / 38,15 mdMB at the HN of Cucuieți.

Access to objectives along the Argeș river

➢ ***Roads for emergency interventions, operation and maintenance*** along the Argeș river will be built on both banks. They will have a 6.00 metre carriageway and an 8.00 metre platform.

On the roads along the dyke crests, development works may be envisaged in order to create infrastructure for cycle-tourist routes.

➢ ***The road access to the port of Oltenița*** is made by means of Gheorghe Coșbuc Street, located on the right side of the railway access to the current port of Oltenița. After crossing the city's old flood defence embankment (km 1+300), the access road to the new port at the confluence of the Argeș - Danube bifurcates, providing road connections to the river docks and platforms, as well as to those at the confluence of the Argeș - Danube rivers.

The road access, in the present documentation, has a carriageway with a width of 7.0 m and a platform of 9.0 m. The road structure consists of asphalt.

➢ ***The railway connection to the port of Oltenița*** - the Danube berths - branches off from the railway line serving the current Oltenița port and heads towards the berths made at the river, at the mouth of the Argeș river.

The access railway line to the new the port of Oltenița, built in 1987 - 1988, was decommissioned in the period that followed, and part of the land on which the railway embankment had been built was leased to economic operators.

The railway works for the connection to the new the port of Oltenița will consist of:

- rehabilitation of the existing industrial railway line on the site, connected from the Y head to the railway station of Oltenița, 1.5 km long;
- 1.7 km long railway connection from the existing industrial railway line (IRL) to the port platform;
- two railway lines in the port platform, with a minimum net length of 700 m.

➢ ***The road access to the hydrotechnical node HN 1 of Oltenița*** is provided on Dr. Lucian Popescu Street. After crossing the flood defence embankment (km 0+950), the access road to the hydrotechnical node is located on the route that was realised ever since 1986-1987. The access road to HN1, from the town's flood defence embankment face to HN1, has a carriageway width of 7.0m and a 9.0m platform. The road structure on this section is of crushed stone.

➢ ***The road access to the hydrotechnical node HN 2 of Budești*** is realised from the relocated county road DJ 301.

The access itself has a crushed stone road structure with a 7.0 m wide carriageway and a 9.0 m platform.

➢ ***The road access to the hydrotechnical node HN 3 of Gostinari*** is planned to be realised from the county road DJ 412. The road structure is made of crushed stone and the carriageway is 7.0 metres wide.

➢ ***The road access to the hydrotechnical node HN 4 of Copăceni (Varlam)*** is provided from the county road DJ 412, as well as from the communal road DC 100 with access to county road DJ 410 A, and from the national road DN 5 Bucharest - Giurgiu. The access uses existing roads up to the node area, from where it goes up to the platform of the hydrotechnical node.

➢ ***Road access to the port of 1 Decembrie*** is via a road built between 1986 and 1990. This road branches off from the national road DN 5 Bucharest - Giurgiu at the entrance to 1 Decembrie. It has a 7.0 m wide carriageway and a 9.0 m platform. The road structure is made of asphalt for most of its length. The asphalt structure will now be realised on the final section, including the platform for the operational constructions in the area.

➢ ***Rail link to the port of 1 Decembrie***

This 8.2 km long railway link was built between 1986 and 1990, starting from Jilava railway station.

For this rail link, an overpass was built over the DN5 national road, as well as a metal bridge (lattice girder with a low track) over the Sabar river with a span of 42.0 m.

In the immediate vicinity of the port platform, an approach yard with three railway tracks - each having a minimum net length of 750 m - was also constructed. From this approach yard, access to the railway lines on the port platform is provided.

All these works have been completed and have been functioning, allowing the supply of materials for the construction of the port and the hydrotechnical node HN 4 of Copăceni/Varlam.

In the period that followed, the railway's superstructure - rails, sleepers, track material - were lifted and "recovered". After removing the rails and sleepers from the railway bridge superstructure, a reinforced concrete slab was poured and the railway embankment in the Jilava area was turned into an access road to the land in the area. On most of the route of the disused railway, the embankments are covered with vegetation and rubbish.

The railway link to the port of 1 Decembrie consists of:

- an industrial railway line, connected from head X to the railway station of Jilava, 8.2 km long, with a 50 m long avoidance line.
- railway approach yard, located on the link line and provided with 3 lines, with a minimum net length of 400m, covered with shunting signals, in which trains arriving from the CFR network will be split up on the bay loading fronts. The dimensioning of these lines has been made taking into account that they have to take up train sets that will come from the CFR network and will not be able to be processed in the CFR link station.
- 2 railway lines on the port platform, with net lengths of 280m.

Access to the objectives on the Dâmbovița river

➢ ***The roads intended for emergency interventions, operation and maintenance along the Dâmbovița river*** are roads for the access of machinery for interventions in case of need to work on the navigable canal.

These roads will be built either on the crest of the dams in the fill areas or on their banks in the cut areas of the navigable canal, on both banks.

➢ ***Road access to the hydrotechnical node of Cucuieți***

The access to this hydrotechnical node is made on a communal road that branches off from the county road DJ 301 in Cucuieți. The road is made of crushed stone with a carriageway width of 7 m and a platform width of 9.0 m.

➢ ***Road access to the hydrotechnical node of Tânganu***

Access is from the county road DJ 301 on a street in Tânganu. The road connects to the left bank in the area of the node. On the right bank, access to the node is made via the road alongside the development.

➢ ***Road access to port of Bucharest - Glina***

The access to the port of Bucharest - Glina will be made from the slip road connecting the ring road of the capital to the A2 motorway.

The access road is 0.250 km long, the carriageway is 7.0 m wide and the platform is 9.0 m wide. The road structure will be asphalt surfaced.

➢ ***Railway link to the port of Bucharest - Glina***

The port of Glina will be linked to the railway network by a:

- railway link from head Y of the railway station Bucharest South, technical group, 2.1 km long, overcrossing the Bucharest ring road and the railway ring;
- 2 railway lines on the port platform, with a net length of 400 m.

The route of the link runs along the ring railway line, between the ring railway line and the ring road of the municipality, intersecting the Bucharest - Constanta motorway under the existing overpass.

The location of the port of 1 Decembrie was chosen in the area of a meander of the Argeș River, on the left bank of the river, between Dărăști and 1 Decembrie, avoiding the expropriation of arable land or forests. The Port of 1 Decembrie will ensure, mainly together with the Port of Glina, the flow of goods traffic necessary for the capital.

The geotechnical studies carried out on the site of the works revealed a coarse alluvial complex under the soil layer, belonging to the Colentina meadow formation, whose thickness varies between 4.8 - 14.7 metres and is predominantly composed of gravelly sands and sometimes boulder, whose grain sizes vary both in plane and in depth.

Port platforms and constructions on platforms.

The port platforms were made of plain concrete. So far the platforms in the crane tracks have been realised.

The following constructions were planned on the port platforms: the operating building including the port administration, the river station, the fleet and port operating group, the general cargo warehouse, the maintenance and repair workshop for port equipment, the firefighting shed, the sanitary facility and the canteen for dockers, the platform toilet, the transformer station, the traffic light and pilot station, and the gate cabins. It also includes works on the platform sewerage, exterior lighting, water supply, sanitation, ventilation and heating.

Along the whole length of the operational quays, the engineering project has foreseen the possibility of operating with 16 tf Bocșa gantry cranes travelling along the quays and platform machinery.

Construction solutions for the port

The construction solution for the quays related to the operational berths was a vertical pile quay with a superstructure of reinforced concrete beams, founded on drilled columns. According to the design, the passenger berths, the special berth, together with the convoy assembly/disassembly waiting front will be sloped, with the quay section reinforced by revetments.

The pile-supported quays, planned for a total length of 1450 metres, are founded on drilled columns with a diameter of 1.10 m and a length of 23.50 m.

By 1990, all the 584 planned columns had been realised, to which approx. 20 test columns were added. The test columns were tested under vertical and horizontal loads. Along the alignments, piles were arranged as follows: 2x124 columns on the north side of the port, 2x26 columns on the west side, 2x64 columns on the middle side, 2x18 columns on the east side and 2x60 columns on the south side.

The columns were executed from land (upper elevation +65.50 mrMB) and were arranged in two rows, with a distance between them in transverse direction of 10.875 m, equal to the track width of the 16 tf Bocșa crane. Along the length of the quays, the spacing between columns is 5.00 m (centre-to-centre).

The columns, as the foundation elements of the quays, transmitted the stress to the ground by means of resistance on the lateral surface and on the top. In accordance with the loads required to be taken over, these columns were founded at an elevation of +42.00 mrMB, in a layer of sands or gravels. The foundation was made in sands or gravels so that the grout injected in these layers would increase the bearing capacity of the columns by reinforcing the ground.

Superstructure

The quay superstructure was planned as follows

- Reinforced concrete column heads at the top of columns
- Longitudinal and transverse monolithic beams
- Strips with prefabricated gaps for part of the sections
- Precast concrete beams on wall faces
- Monolithic reinforced concrete running beams

Quay structures using strips with gaps have been called type A quays and are found on those sides of the port that will not be served by railway lines. The cumulative length of the type A quays is 750 metres, of which 590 m have been completed so far; for the remaining 160 m, only the bored columns have been installed to date.

The quay structures in the composition of which decks were used were called type B quays and are found on the sides of the port where it was planned to lay two railway wires between the running beams of the cranes for the transfer of goods between barges in the railway wagons. The length of the type B quays is 700 m, and they have been fully executed to date at superstructure level.

In order to minimise the stresses due to temperature variations, the quays were divided into 40 m sections with 5 cm transverse joints. At each joint, neoprene bearing blocks were installed on metal plates embedded in the column heads at the joints.

The dimensions of these column heads - whether at the waterline or at the joints - vary depending on whether the quay is Type A or Type B.

Both types of quay are fitted with longitudinal and transverse corbels. The longitudinal corbels are centred on the axis of the rows of columns at a distance of 10.875 m and are provided at the top with a channel for positioning the crane's running wires. The transverse corbels are located in correspondence to the joints.

The column heads, lower footings and beam elevations were planned to be made of BH 300 monolithic concrete (C18/22.5) and OB 37 and PC 52 reinforcement. These monolithic concrete mixes were poured on a layer of crushed stone and levelling concrete.

The hollow-core slabs, used for type A quays, were made of prestressed concrete BH 400 (C25/30), while the deck beams were made of reinforced concrete BH 300 (C18/22.5) and used for type B quays. The deck beams are T-shaped, with 4 intermediate diaphragms under the railway track and two end diaphragms.

The quay accessories for berth operation are:

- Rubber shock absorbing rollers mounted on the front of beam faces; the rollers are 4m long
- Reinforced concrete dead heads Ø 40 cm, protected by a metal liner, installed at a distance of 0.7 m from the front of the crest
- Metal access staircases built in the monolithic area of the vertical wall facing, over its full height, protected by wooden guardrails
- Concrete bumping posts of special shape, fixed at the ends of the running rails, next to columns
- Cable channel beam, made of prefabricated elements, laid next to the crane's runway rail on the land.

Slope protections under the metal deck. The project provided a stable slope under the metal deck. The slope is 1:1.5 in between and was made with two benches at 60.0 and 62.0 mrMB, necessary to ensure stability.

Slope protections under the metal deck. Mechanised excavations were carried out under the metal deck, with the grab loader above and below the water level in front of the quay (dredging in the river bed with absorbent dredge - rebounding dredge was also necessary below the water level) and with a long reach excavator on the slope above the water level, between the columns. On the line of the profile obtained from the excavations, a fascia mattress was laid at the base of the revetment.

The protection of the slope under the deck was achieved by the construction of a prism made of crushed rock, which was placed from a flatboat at the foot of the slope and with a rail-mounted crane from the slope, followed at the top by a stone revetment. This wall solution has been used on all sides of the port, except on the side facing the river, where the defence solution is a concrete revetment with a BH 200 (C12/15) plain concrete beam at the base.

Construction solutions for reinforced sloped quays

According to the project, in the Port of 1 Decembrie 250 m of reinforced sloped quays in the upstream part of the port basin and 650 m in the downstream part of the port basin will be built. The construction solution was chosen to minimise material consumption and is identical for the two quays. The excavations for the execution of the reinforced sloped quays were planned to be made with a clamshell grab, working from dry land. So far, these quays are 90% complete.

The upstream reinforced sloped quay allows passenger and other vessels to moor at the pontoons. Those pontoons will be anchored to the quay's mooring bitts and secured by means of props in special recesses. The downstream reinforced sloped quay is used to station convoys waiting to enter the port. Both quays have a slope of 1:1.5 and have the following composition: a foundation made of a rockfill prism placed atop a 60 cm-thick fascine mattress The rockfill prism is built with a 4.00 m-wide berm at its top. Its water-side slope is set at 1:1.5, and the land-side slope at 1:1.

On the prism's top and along the water-side slope up to elevation +61.50 m mrMB, the execution solution foresees a stone revetment with masonry in rough stone and cement mortar.

On the land-side slope, the rockfill prism rests on a drainage layer of ballast. At elevation +63.50 m mrMB, a monolithic BH 200 reinforced-concrete beam (C12/15), serving as the foundation for the actual revetment, is to be cast on a bed of crushed stone. Between elevations +63.50 and +66.50 m mrMB, a 30 cm-thick stone revetment is laid atop a 30 cm-thick inverted filter layer composed of crushed stone and sand. The slope of this revetment is 1:1.5. At the quay crest (elevation +66.50 m mrMB, which is +3.5 m above the NRL), a B 200 plain-concrete beam (C12/15) was constructed, with its exposed edge protected by a metal angle strip.

In the revetment there are access stairs for both the upstream and downstream quay, made of prefabricated elements B 200 (C12/15) between +62,95 and 66.50 mrMB.

To fix the props, recesses were provided on the berm at elevation +63.50 m mrMB.

Passenger ships will moor alongside the reinforced sloped quays via a floating pontoon, with shore access provided by a metal gangway.

To support the metal gangway intended for access to the pontoon, three (and two, respectively) monolithic reinforced-concrete embedment blocks of specific shape were cast at elevation +66.50 m mrMB, founded down to +65.30 m mrMB. Behind this embedment, a well-compacted earth fill was placed.

For the smooth operation of the reinforced sloped quays, quay accessories include reinforced-concrete bitts for mooring vessels or pontoons, and steel mooring rings for securing small boats.

Status of structures upon the interruption of the works

Works for the Port of Bucharest - 1 Decembrie were halted in December 1989, at the stage they were at that time. So far, some of the work has been partially destroyed, stolen or damaged. The state of execution of the works and their technical condition are presented below:

By the time the works had been halted, all 584 columns in the foundations of the pile quay had been completed. The superstructure of the quays has been completed, except for a 160 m section on the south side of the port, where only the drilled columns (piles) and excavations for the shore protection under the metal deck have been completed.

On the rest of the sections, the pile-supported quays have been fully completed (infrastructure,

superstructure and bank protection under the deck). On these sections, the arch bricks at the quay crest were completed, and the crane rail tracks were installed, but have since been stolen. Quay fenders and metal access stairs were not installed.

2.3.2.4 Works to be executed

The hydrotechnical works to be executed for the completion of the port of 1 Decembrie are as follows:

- Investigation of bored piles in the unfinished section 32 pcs
- Remediation of deficiencies in bored piles from the unfinished section (discontinuities or shorter lengths than those designed) 10 pcs
- Completion and extension of existing bored piles 32 pcs
- Sandblasting and rehabilitation of existing bored piles 450 lm
- Standard pile caps on the water side 28 pcs
- Standard pile caps on the land side 28 pcs
- Expansion joint pile caps on the water side 4 pcs
- Expansion joint pile caps on the land side 4 pcs
- Longitudinal beams on the water side 4 pcs
- Longitudinal beams on the land side 4 pcs
- Set of 2 cross beams 4 pcs
- Prefabricated wall face beams 32 pcs
- Precast hollow core slabs 154 pcs
- Monolithic deck slab 1800 sq. m
- Concrete platforms behind the quay walls 1490 hundred sq. m
- Macadam platforms 620 hundred sq. m
- Self-levelling concrete for covering exposed reinforcements of structural elements 250 m3
- Mortar for covering exposed reinforcements of vertical wall face beams 40 mc
- Railway track for quay cranes, including metal mounting accessories for mounting rails 2810 lm
- New mooring bollards 5 pcs
- Cladding of existing arch bricks 5 pcs
- Metal access stairs 7.5 tons
- Quay fenders, 4m each 290 pcs
- Reinforced concrete bitts 7 pcs
- Steel mooring rings 7 pcs
- Paints, including cleaning of existing metalwork 200 kg
- Completion of the quay with reinforced sloped quay on the southern side 30 ml

- Construction of concrete revetment under the pile-supported quay on the 160 m unfinished section 32 hundred sq. m
- Repair, reprofiling, and cleaning of reinforced sloped walls and revetments under pile-supported quays 50 hundred sq. m
- Floating pontoon 1 pc
- Metal gangway for pontoon access 1 pc
- Excavations 2000 hundred m3
- Dredging works 250 thousand m3.

2.3.2.4.1 Port of Oltenița

The Port of Oltenița is located at the confluence of the Argeș River and the Danube River. The port of Oltenița has operational fronts on the left bank of the Argeș river and on the Danube. The port's waiting faces are provided on both the left and right banks of the Argeș river.

The port of Oltenița is made up of two distinct sectors. The Danube sector includes one operational berth with a length of 110 m, extended downstream by a 120 m waiting area. This sector was originally intended for unloading quarry products, ballast and building materials. The estimated traffic capacity of this berth is approximately 1,500,000 tons/year.

The sector on the left bank of the Argeș river is located at the outlet of the navigable canal into the Danube and includes two operational berths, with a total face length of 200 m. The berths continue upstream with a 100m-long waiting area. The upstream berth was originally intended for grain traffic, while the downstream berth was intended for general warehouse and platform cargo traffic. The total traffic capacity of the Argeș berths is approximately 3,000,000 tons/year.

The development plan for the Port of Oltenița includes the construction of quay and operating platforms, as well as waiting areas. The operating quays are of the vertical face pile-supported type, while the waiting areas are planned as a sloped reinforced quay.

The construction solution for the quays of the Argeș and Danube berths is of the vertical face pile-supported type, with a reinforced concrete superstructure, founded on bored columns.

Infrastructure. The vertical pile-supported quays in the Port of Oltenița have an infrastructure of drilled reinforced concrete columns with a diameter of 1.50 metres. The columns related to both of these quays were drilled down to -6.0 mrMB with at least 2.0 m of bedrock embedment. The top elevation of the columns was set at +17.10 m rMB.

Due to the significant structural loads and height of the quay wall, it was necessary to found the deck on three rows of columns. The first row of columns on the water side is arranged 2.25 m inland from the quay crest line, and the other two rows are spaced at 10.875 m centre-to-centre, equal to the track width of the 16 tf Bocșa crane. The distance between the columns along the quays, on each row, is 7.50 metres centre-to-centre.

So far, 27x3 + 15x3 = 126 columns have been drilled. The columns were made on land.

Superstructure. The technical solution for the superstructure of the quays is similar to the one adopted at the Port of Bucharest - 1 Decembrie. The deck and the vertical face of the quay form the two main components of the superstructure.

Construction solutions for reinforced sloped quays

For the waiting of convoys and for conducting assembly-reassembly operations, the initial project included and executed waiting areas with reinforced sloped quays, as follows: on the right bank of the Argeș River, with a length of 665 m; on the left bank of the Argeș River (upstream of the operational area), with a length of 100 m; and on the Danube River (downstream of the operational area), with a length of 120 m. Also, the connection between the two vertical waiting areas was arranged in the form

of a 20 m long quay in line with the vertical quay on the canal, then a curve with a radius of 80 m at the upper edge of the quay and again in line with the vertical quay on the Danube for a length of 33 m.

The mooring of passenger vessels to the reinforced sloped quays will be made at a floating pontoon and access to the shore will be made by means of a metal gangway.

For the proper operation of the waiting areas, the following quay accessories are required: access stairs on the slopes leading to berms at elevations +12.5, +16.5, and +20.0 m rMB; reinforced concrete bitts placed on the platform at elevation +20.0 m rMB, spaced at 25.0 m intervals and located 1.4 m behind the quay crest; wall recess for the pedestrian gangway placed at the same elevations (+12.5, +16.5, +20.0 m rMB), made of reinforced concrete. At each wall recess, the installation of cavities for the props is planned - one on each side of the recess, located 8.6 m from the centreline. Steel mooring rings will be mounted on the revetment, secured in concrete blocks.

- ***The Danube routing mole***

In order to direct the water currents at the outlet of the canal into the Danube, the construction of a mole was planned, which has not been realised so far. The orientation of this mole and its dimensions have been established based on hydraulic modelling studies and research.

On the hydraulic modelling of the channel link area with the Danube riverbed, the influence of the routing mole was analysed in terms of rates of flow in four variants of mole length, namely 350 m, 250 m, 150 m and 50 m. It was found that for the most unfavourable situation in terms of tributary discharges, i.e. when the Danube has low discharges and levels (2,130 m3/s) and the Argeș has high discharges and levels (Q = 1,260 m3/s), the overflow velocity of the Argeș river decreases from 6 m/s in the 350 m routing mole variant to 2.5 m/s in the variant with a short routing mole, with a length of 50 m.

Based on these results, it was determined that the routing mole would be built with a length of 50 m, with potential adjustments in length or orientation to be made after the canal becomes operational and diverse discharges conditions are observed in the outlet area. The mole will be built non-submersible, with an elevation of +20 mrMB at the crest.

The cross-section of the mole will be trapezoidal in shape, with a 12.0m width at the crest and 1:1.5 slopes with a 3.25 m wide berm on each side at elevation +16.5 mrMB, while at elevation +12.5 mrMB the berm is 5.50 m wide. The mole will be made of local excavated material, protected up to +12.5 mrMB with rockfill prisms, and further up to +20.0 mrMB, it will be protected with a revetment of rubble masonry laid in cement mortar. The rockfill prisms will consist of raw stone placed on a fascine mattress. At the base of the stone revetment, a concrete foundation beam made from BH 200 (C12/15) concrete will be installed.

The downstream end of the mole is circular in shape, protected like its sides, while the upstream end is to be embedded into the Danube bank. The protection on the Danube side of the breakwater is to be connected with the protection of the Danube bank, executed up to +14 mrMB, in order to avoid degradation in the area where the breakwater is embedded into the bank. The revetment on the port waterbody will continue along the upstream side of the port basin.

Works at Oltenița Port were suspended in December 1989. Up to that point, the following works had been completed: the integrated operational quays (infrastructure and superstructure) for both sectors of the port, the connection between the vertical face walls, the downstream waiting area of the Danube berth and partially the upstream waiting area of the Argeș berth, the waiting area on the right bank of the Argeș, partially the dredging of the port basin, partially the road access. The reinforced routing mole on the Danube has not been built.

Currently, some of the executed works are partially damaged or deteriorated.

Remaining works to be executed for the completion of the hydrotechnical infrastructure at the Port of Oltenița are as follows:

- Construction of non-submersible routing mole on the Danube 80 hundred sq. m

- Repair of the closing beams of the pile-supported quays 4 pcs
- Concrete platforms behind the quays 240 hundred sq. m
- Macadam platforms 230 hundred sq. m
- Self-levelling concrete for covering exposed reinforcements of structural elements 120 m3
- Railway track for quay cranes, including metal mounting accessories for mounting rails 600 lm
- Bollard guniting 6 pcs
- Solid rubber quay fenders 132 pcs
- Metal access stairs 2.5 tons
- Reinforced concrete bitts 11 pcs
- Steel mooring rings 11 pcs
- Concrete bumping posts for cranes 2 pcs
- Paints, including cleaning of existing metalwork 75 kg
- Restoration of the reinforced sloped quay on the left bank upstream of Argeș river 800 sq. m
- Floating pontoon 1 pc
- Metal gangway for pontoon access 1 pc
- Excavations 30 hundred m3
- Dredging works 650 thousand m3.

The port of Glina, the terminal point of navigation on the Dâmbovița River, is located outside Bucharest's ring road, opposite the capital's wastewater treatment plant, currently still under construction.

The location of the port is suitable for road and rail connections, being adjacent to the western ring road and railway, and to the A2 motorway to the north.

The port develops in the form of a 136.15 m wide basin on the left bank of the Dâmbovița river, with three operational berths, one passenger berth and one waiting area.

Given its proximity to the ring road, the Port of Glina was designed to handle general cargo, including containerized goods, while bulk goods are directed to the Port of 1 Decembrie. The port of Glina can handle up to 3,500,000 tonnes of cargo per year.

In the port of Bucharest - Glina, operating quays have been planned, as well as a mooring area for ships and a waiting area.

The construction solution to realise the mooring area consists of a slurry wall made with a Else wall cutter, with a length of 345 m, anchored by pre-tensioned tie rods to the walls made using a Kelly bar, placed 30 m away from the slurry wall. The wall was made of 5 m wide panels embedded in bedrock at + 35.0 mrMB. The reinforcement casings were 4.8 m wide and 0.6 m thick and were fitted with plain concrete guide rollers. The wall was concreted using hydraulic concrete BH 250 (C16/20) with PA 35 cement.

The cut-off walls built using Kelly bars were made of 2.4 m wide and 0.6 m thick panels spaced 5m apart. The same concrete was used for the cut-off walls as for the Else slurry wall, namely BH 250 (C16/20) with PA 35 cement. The bars were embedded in bedrock at elevation + 35 mrMB.

Front beams were installed to align and stabilize the Elese wall panels. For their execution, concrete was removed up to +51.5 mrMB. Expansion joints were provided every 50 m in the beam. The joints are arranged vertically on a panel joint. Utility ducts were included for anchor cable installation and stormwater drainage from the slope adjacent to the port platform.

Anchoring cables were monolithically embedded in the front beam at one end, and installed in recesses in the Kelly bars at the other end. After their fixation and tensioning, the cables were grouted

with cement slurry, ensuring a monolithic active anchor within the wall made using a Kelly bar.

Between the existing platform and the grass-covered slope up to the level of the adjacent land, a reinforced concrete angle-type retaining wall, 1.20 m high, was constructed.

At the ends of the operational area, two access stairs were installed (upstream and downstream of the existing platform), made from prefabricated reinforced beams, resting on support beams integrated into the monolithic beam at the toe of the grassed slope.

Remaining works to be executed for the completion of the hydrotechnical works related to the Port of Glina and for the installation of appropriate cranes are as follows:

- Drilled columns Ø 1.18m 112 pcs
- Crane travelling beams, L = 40 m/piece 14 pcs
- Concrete platforms behind the quays 310 hundred sq. m
- Macadam platforms 350 hundred sq. m
- Self-levelling concrete for covering exposed reinforcements of structural elements 250 m3
- Railway track for quay cranes, including metal mounting accessories for mounting rails 670 lm
- New mooring bollards 12 pcs
- Quay fenders, 4m each 60 pcs
- Metal access stairs 1.5 tons
- Reinforced concrete bitts 12 pcs
- Steel mooring rings 12 pcs
- Concrete bumping posts for cranes 4 pcs
- Floating pontoon 1 pc
- Excavations 40 hundred m3
- Dredging works 35 thousand m3.

2.3.2.4.2 Hydrotechnical Node HN1 of Oltenița

The hydrotechnical node no.1 was located on the left side of the Argeș river at km 2+281 near Oltenița, before the outfall of Argeș river into the Danube.

This hydrotechnical node includes:

- a lock with two adjacent chambers, with a net width of 12.50m, a length of 177.00m, located symmetrically to the axis of the canal, on both sides of the canal
- A large spillway on the left bank of the canal
- Routing and mooring construction works upstream and downstream of the lock
- Two central breakwaters, one upstream and one downstream

The mooring and routing construction works and the central breakwater are made of reinforced concrete and have a continuous inner wall directed towards the interior of the port, between levels +23.50 and 26.50 mrMB, which ensures mooring operations for ships.

The continuous face of mooring structures is 130.00 m long, and it is rectilinear and parallel to the centre line of the canal. The distance from the centre line of the canal to the wall facing towards the canal is 45.00 m.

The infrastructure of the mooring constructions is designed so as to be made of columns with a diameter of Ø 1.10 m, placed on two rows. The distance along the quay is 10.00 m, and 8.00 m crosswise. The water-side row of columns is at a distance of 46.20 m from the centre line of the canal, and the shore-side row is at 54.20 m.

The routing structures play a double role: they ensure the transition from the width of the upstream mooring port from 90.00 m to 43.20 m, which is the width of the upstream gate of the lock.

They separate the water basin in the waiting port located upstream from the water current flowing parallel to the centre line of the canal, a current which is due to the spillway and the speed of which is higher than the speed of the water in the port basin, and the turbulence thus caused would affect the safe movement of ships.

The infrastructure of the routing constructions is designed so as to be made of columns with a diameter of Ø 1.10 m, placed on two rows. They are laid out in plane as follows: towards the lock, they form a second-degree parabola followed by a 1:4 inclination alignment which is connected to the mooring area by an arc of a circle featuring a radius R=L/2 (where L is the length of the calculated convoy).

Central breakwater

It is a reinforced concrete construction, located on the centre line and in front of the locks, symmetrical to the centre line and shaped as a third-degree parabola, which at the end towards the port is joined by an arc of a circle. Its width at the end towards the lock is the width of the lock plus the width of its side walls.

Its length is roughly equal to half the length of the routing structures.

The infrastructure of the central breakwater is designed so as to be made of columns with a diameter Ø = 1.10 m, placed symmetrically on both sides of the lock centre line.

The breakwater has 3 distinct areas: the breakwater head, the trunk and the area adjacent to the lock.

According to the design of the superstructure of the waiting port (mooring structures, routing structures and central breakwater) (between levels +23.50 and 26.50 mrMB), it will be built by assembling F-shaped prefabricated reinforced concrete beams, with a 3.00 m long vertical wing, an upper horizontal wing of 1.80 m and a lower wing of 1.25 m. Wing thickness is 20 cm. The upper plate features a 20 cm-wide, 10 cm-deep recess intended for housing cables for lighting, telephone and signalling installations.

The upper level of the wall facing is 26.50 mrMB. Prefabricated structures are 9.00 m long for the mooring and routing constructions and different for the breakwater, and the length is determined depending on the distance between the two branches of the parabolas at the bearings. Prefabricated structures have two vertical core walls for strutting and bracing the wings and two vertical core walls at the end to facilitate the installation of the monolithic structures.

The water-side column heads are sized 2.00 x 1.60 m in plane, while the shore-side ones are sized 1.60 x 1.60 m in plane and 50 cm thick for mooring and routing structures.

In order to take over the stresses generated by the collision of ships with the wall facing upon mooring operations and the bollard pull, there will be a second row of columns sized Ø 1.10 m, placed 8.00 m inland from the first row of columns, for mooring and routing structures is to be built

The connection for the mooring and routing constructions between the two rows of columns is made by inclined precast reinforced concrete beams, placed at an angle of 30° to the horizontal line, with the end towards the centre line of the canal reaching higher and the end towards the shore-side at a lower level.

The prefabricated beams for the mooring and routing structures are 70 x 100 cm in cross-section and 7.21 metres in length, featuring a special shape at the shore-side end to ensure their support. At the water-side end, until the beam is joined to the monolithic pier, the counterbrace will sit on a cross-arm of the monolithic pier.

Cross braces of the central breakwater are perpendicular to the centre line of the canal, and are installed on the transverse axes of the columns. They have an I-section with a height of 1.40 m and 75 cm wide bases.

The breakwater head consists of a rigid assembly of 3 piers coming from the rigid reinforced concrete

metal deck and is reinforced at the top with a 40 cm thick reinforced concrete slab.

The vertical face of the breakwater head features a circular arc and consists of a 40 cm thick curved plate embedded in the three vertical piers, with the outer side in line with the facing beams of the breakwater trunk area.

Downstream

The mooring and routing construction works and the central breakwater are made of reinforced concrete and have a continuous inner wall directed towards the interior of the port, between levels +10.70 and +19.60 mrMB, which ensures mooring operations for ships.

The continuous face of mooring structures is 130.00 m long, and it is rectilinear and parallel to the centre line of the canal. The distance from the centre line of the canal to the wall facing towards the canal is 45.00 m.

The infrastructure of the mooring constructions is designed so as to be made of columns with a diameter of Ø = 1.10 m, placed on two rows. The distance along the quay is 10.00 m, and 8.00 m crosswise. The water-side row of columns is at a distance of 46.20 m from the centre line of the canal, and the shore-side row is at 54.20 m.

The routing structures play a double role: they make the transition from the 41.20 m width of the lock to the 90.00 m width of the downstream waiting port.

- They separate the water basin in the waiting port located upstream from the water current flowing parallel to the centre line of the canal, a current which is due to the spillway and the speed of which is higher than the speed of the water in the port basin, and the turbulence thus caused would affect the safe movement of ships.

The infrastructure of the routing constructions is designed so as to be made of columns with a diameter of Ø = 1.10 m, placed on two rows. They are laid out in plane as follows:

- towards the lock, they form a second-degree parabola followed by a 1:4 inclination alignment which is connected to the mooring area by an arc of a circle featuring a radius R=L/2 (where L is the length of the calculated convoy).

2.4 Main features of the execution period

2.4.1. Duration and execution plan

The estimated duration for completing the investment objective is 70 months.

The stages to be carried out are detailed in the Programme of Works below and include expropriation, design, site organisation, dykes, Kelly cut-off walls, bank defences, port structures and platforms, hydrotechnical node structures, roads, bridges, railways, construction for the proposed works on both the Argeș and Dâmbovița rivers.

To ensure that the works under the present investment are carried out in conditions of maximum safety, the works carried out, including the related installations, will be monitored over time and the necessary regular maintenance work will be carried out without delay.

The correct functioning of the utility networks will be checked at least twice a year or after extreme meteorological events, which may affect their proper functioning.

The control of electrical equipment related to the safety of the works will be permanently checked and intervention will be carried out whenever failures are found.

The staggered schedule of works is shown in the following table:

PROGRAMME OF WORKS

Nr. Crt.	Tipul activitatii	ANUL 1				ANUL 2				ANUL 3				ANUL 4				ANUL 5				ANUL 6			
		SEM. 1	SEM. 2	SEM. 3	SEM. 4	SEM. 1	SEM. 2	SEM. 3	SEM. 4	SEM. 1	SEM. 2	SEM. 3	SEM. 4	SEM. 1	SEM. 2	SEM. 3	SEM. 4	SEM. 1	SEM. 2	SEM. 3	SEM. 4	SEM. 1	SEM. 2	SEM. 3	SEM. 4
AMENAJARE ARGES																									
1	Exproprieri																								
1	Proiectare																								
3	Organizare de santier																								
4	Diguri																								
5	Ecrane Kelly																								
6	Aparari maluri																								
7	Structuri portuare + Platforme																								
8	Structuri noduri hidrotehnice																								
9	Drumuri																								
10	Poduri																								
11	Constructii																								
12	Cai ferate																								
AMENAJARE DAMBOVITA																									
1	Exproprieri																								
2	Proiectare																								
3	Organizare de santier																								
4	Diguri																								
5	Ecrane Kelly																								
6	Aparari maluri																								
7	Structuri portuare + Platforme																								
8	Structuri noduri hidrotehnice																								
9	Drumuri																								
10	Poduri																								
11	Constructii																								
12	Cai ferate																								

2.4.2. Works necessary for the site organisation

While the works are being carried out, it is necessary to organise the construction site, where the materials necessary for the execution of the works will be stored, as well as the waste resulting from the execution of the works and where the mobile container for the lockers, the container for the janitor and the fire-fighting facility will be located. For the site organisation, an area will be set up for parking vehicles and machinery used for the works and sanitary facilities with retention toilets will be provided.

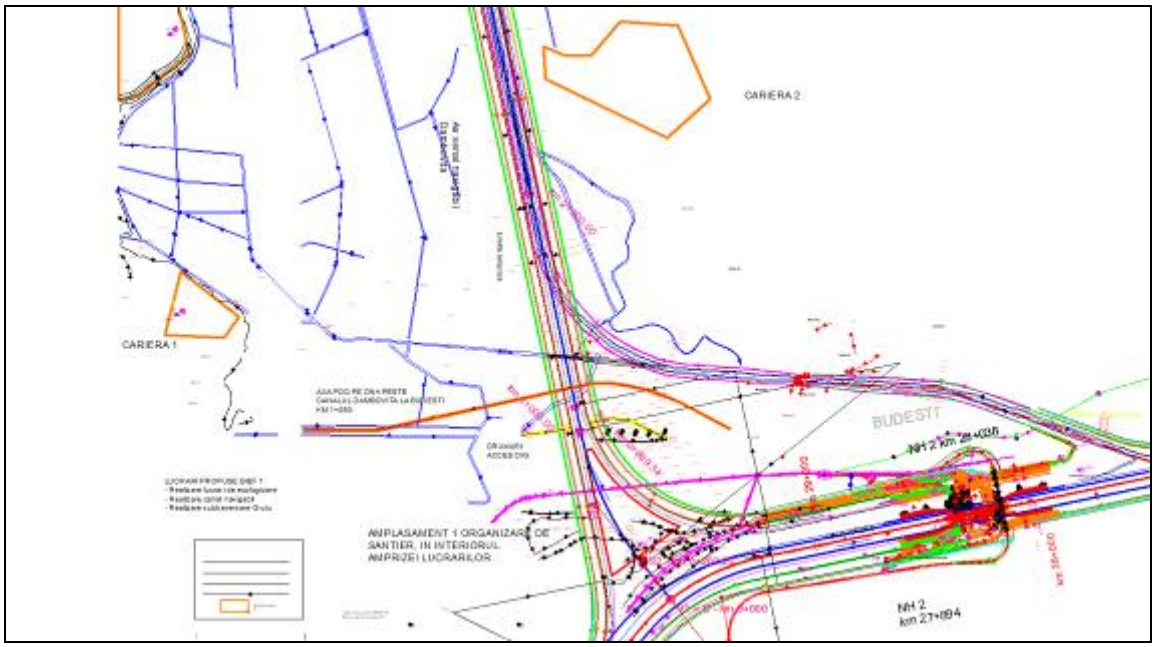
The following locations were proposed for the site organisations (Fig. 10):

- Argeș Canal:

- km 0 + 230 - Port of Oltenița;
- km 0 ÷ km 2 - Reach 0;
- km 2 + 282 – Hydrotechnical Node 1 - Oltenița;
- km 2 ÷ km 28 - Reach 1;
- km 28+337 - Hydrotechnical Node 2 - Budești
- km 28 ÷ km 53 - Reach 2;
- km 53+475 - Hydrotechnical Node n3 - Gostinari
- km 53 ÷ km 63 - Reach 3;
- km 63+000 - Hydrotechnical Node 4 -Copăceni
- km 63 ÷ km 73+289 - Reach 4;
- km72 + 000 - Port of 1 Decembrie;
- km 73 +289 ÷ km 82+918 - Reach 5;
- km 82+918 - Hydrotechnical Node 5 - Adunații Lake (not part of this investment)

- Dâmbovița Canal:

- km 0 ÷ km 15 - Reach 1;
- km 15 + 128 - Hydrotechnical Node 1 - Cucuieți;
- km 15 ÷ km 23 - Reach 2;
- km 23+353 - Hydrotechnical Node 2 - Tânganu
- km 23 ÷ km 30 + 654 - Reach 3;
- km 30+ 000 - Port of Glina;
- km 30 + 654 - Hydrotechnical Node 3 - Glina.



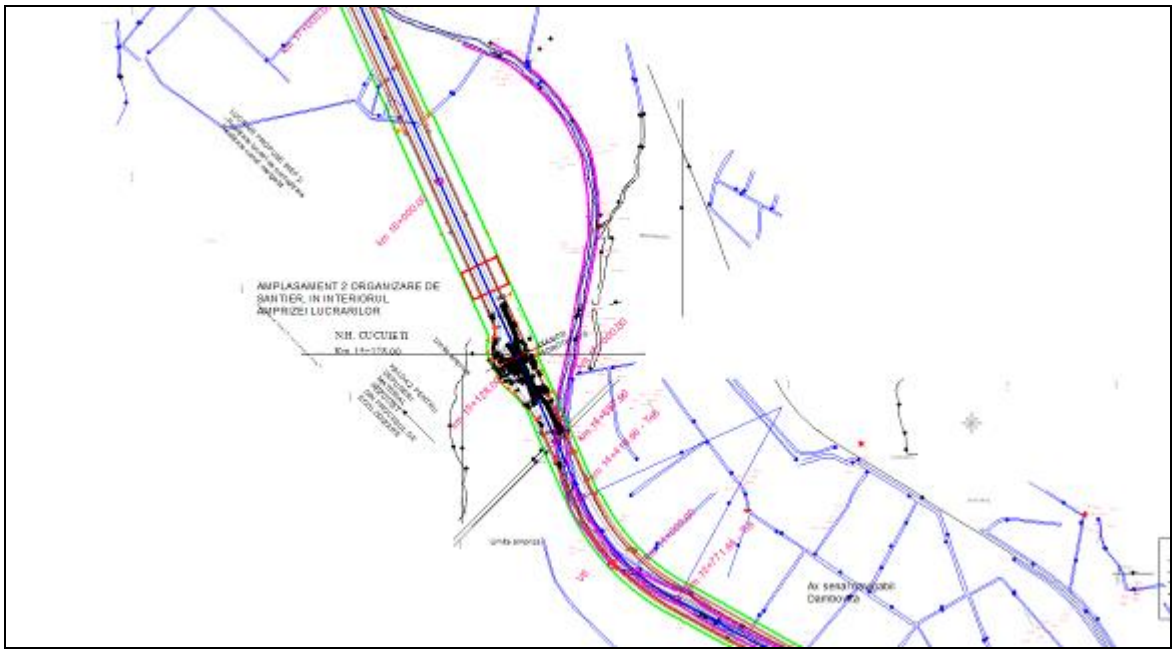


Figure no. 10 - Estimated locations of 2 of the site organisations

The location will be at least 300 m away from residential areas, protected natural areas and identified archaeological remains.

The temporary construction works of the site organisation comprise the following components and activities:

- ✓ *ballasted platform* - used for storing materials, machinery, social-administrative objectives.
- ✓ *fencing* - used to delimit the site organisation, creating a favourable working and safety environment for the contractor.
- ✓ *social-administrative objectives* - mainly made up of: office shed, container, shed, storeroom, retention toilet, metal containers, fire-fighting shed, fire-fighting panel, identification panel, ensuring the works are carried out in safe conditions.

All the site organisation works are temporary works, and after their dismantling, at the end of the works, the land will be restored to its original state and even improved by the environmental protection and restoration works.

For economic as well as environmental protection reasons, the site organisation will be located in as few places as possible in order to make available certain facilities to reduce travel and organisation costs. Such facilities relate to:

- access roads to the works site;
- railway platforms and lines;
- 20 kV electricity network in the vicinity of the site organisation;
- water supplies;
- the possibility to source food from the proximity of the site organisation;
- access routes to borrow pits (where applicable).

The economic reasons for reducing the number of site organisations relate to:

- reduced costs for transporting materials without having to travel long distances;
- maintaining the quality of materials (cement concrete, asphalt concrete) during transport;
- the possibility of locating fixed stations for the preparation of asphalt and asphalt mixes, with positive effects on the quality of the materials to be put into service;

- rational use of machinery or installations, use of a single laboratory for the control of physical-chemical parameters of materials.

From an environmental protection point of view, choosing a minimum number of locations for site organisation has the following advantages:

- avoid uncontrolled losses or accidental pollution by adopting measures for the controlled storage of raw materials, fuels and other materials;
- rational use of water resources;
- providing hygiene and sanitation facilities for workers;
- waste management, including waste water,
- lower expenditure for restoring temporarily occupied land to its original state with the site organisation.

Taking into account the duration of the works, the facilities for each site organisation may be:

- administrative building,
- fuel depots;
- material warehouses;
- installations for the preparation of concrete with associated aggregate stores;
- water storage tank;
- wash and service platform;
- parking of transport vehicles;
- fire-fighting facilities;
- repair and servicing workshops.

The following rules must be observed when preparing site organisations:

- after takeover the site will be cleared of topsoil;
- it will be levelled and compacted taking into account the future use of the land (office, parking, material storage, access roads, platforms for the loading of cranes and truck-mounted concrete pumps, etc.).

The contractor's and sub-contractor's areas, if adjacent, will be delineated with orange polythene tape.

The locations for constructions, access roads, contractor and subcontractor areas, warehouses, and storage areas will be plotted on the site.

The warehouses for materials, raw materials and waste will be organised as follows:

- concrete platforms for the temporary storage of excavated earth and fill, ballast, sand, used asphalt, with perimeter ditches for the collection of rainwater run-off and a settling tank for rainwater pre-treatment;
- concrete, covered and fenced areas for the temporary storage of oils, paints, thinners, asphalt emulsion, spare parts, selectively collected waste, etc.

Separators for oil products will be installed in the areas where car parks and hydrocarbon management areas (fuels, oils) will be set up.

2.4.2.1 Description of the environmental impact of site organisation works

During the execution of the works, some toxic and dangerous substances will be used, in particular petroleum products and thinners, the storage, handling and use of which will comply with the provisions and regulations in force. The most used products are: fuel used for machinery and transport vehicles (petrol, diesel) and lubricants (oils, paraffin). These substances will be purchased from the appropriate stations, or, if it is necessary to supply the workplace with these substances, they will be stored in leak-proof tanks which do not allow exfiltration.

Construction materials (especially dust-generating ones) stored in uncovered deposits can be washed away by stormwater, with fine particles being washed onto adjacent land. Therefore, stockpiles of materials (aggregates, cement, binders, and other types of materials) will be enclosed or covered, in order to avoid the danger of spreading into the atmosphere and depositing on the ground, or seeping into groundwater or surface water bodies via rainwater.

The potential impact of site organisation can be generated by the following factors:

- emissions to air, water and waste generation
- landscape impact during the existing organisation of the construction site (although the area is an industrial one, with areas where it is proposed to perform the construction works related to this project).

The noxious emissions into the atmospheric air will comply with the maximum permissible limits laid down in Order No 462/1993, appropriate collection and discharge systems will be provided for water discharges so as to comply with the quality limits established by the Government Decision No 188/2002, as subsequently amended and supplemented, and the noise and vibration level will comply with the limits allowed by STAS 10009/2017. The impact of the machinery activity on air and water is minimised if the environmental protection rules (as mentioned in the previous chapters 6.1.1 and 6.1.2 of this report) are strictly observed.

The contractor has the obligation not to damage the natural environment of the area through the works carried out on the construction site. Staff will be trained to observe cleanliness in site organisation and hygiene rules.

2.4.2.2 Sources of pollutants and installations for the containment, discharge and dispersion of pollutants into the environment for the duration of the site organisation

The sources of pollutants during site organisation are:

- movement of motor vehicles and machinery;
- activities carried out as part of the site organisation and, implicitly, the activities carried out by the concrete plant and the asphalt mixing plant (if they are to be installed as part of the site organisation);
- stormwater falling on the working platforms of the site organisation.

Where it is not possible to connect the sanitary facilities within the site organisation to the sewerage network, retention toilets will be provided for the collection of waste water. Specialised companies will be contracted to collect wastewater from the site.

It is also recommended to provide a system such as peripheral drainage gutters to collect liquid spills and rainwater run-off and wash down the site organisation platform.

Stormwater collected from the site organisation will be pre-flushed through decanters and hydrocarbon separators.

Domestic wastewater, in cases where it cannot be collected and discharged into a centralized sewerage network, will be conveyed through the internal network arranged within the site organization and discharged into a holding tank with periodic emptying, performed by an authorized local operator.

Depending on the number of persons using water for domestic purposes, a system with one or more holding tanks will be adopted, which will be emptied periodically by the contractor, based on a service agreement concluded with an authorized operator.

2.4.2.3 Emission control equipment and measures

In order to prevent and/or reduce the pollution of environmental factors during the operation of the site organisation, the following measures need to be taken into account:

- the storage of hazardous products / substances used for the execution of the works will be carried out in accordance with the legal provisions in force, in covered areas with restricted access, on a waterproof surface, equipped with a system for collecting accidental spillages
- regular checks of machinery and means of transport for carbon monoxide levels and emission concentrations in exhaust gases. They will be put into operation only after any faults have been rectified
- low-noise equipment will be used wherever possible
- vehicles must be equipped with catalytic converters, maintained in good working condition, and regularly serviced

The following is recommended for the concrete mixing plant and asphalt mixing plant, respectively:

- the provision of textile filters at cement storage silos and the leak tightness check of the pneumatic cement unloading/loading plant are mandatory measures to minimise cement losses and to bring the concentrations of particulate matter in the air within legal limits
- concrete mixing will be carried out using modern technology, with the elevators, weighers-dispensers and mixer located in a perfectly enclosed place
- inactive material stockpiles must be fenced or covered to prevent wind erosion. Measures will also be adopted to cover storage areas for fine aggregates.
- periodic watering of aggregate stockpiles is a temporary measure to reduce emissions and is only carried out for aggregates used for the preparation of concrete and stabilized mixtures.
- modern technology will be used for the preparation of asphalt mixtures, with a mixing plant equipped with filter bags that retain 99.9% of the particles emitted into the atmosphere.
- fuel tanks will be fitted with a closure system.

In order to control the emission of pollutants into the environment, the following will be monitored throughout the works:

- the operating condition of machinery and transport vehicles to reduce the risk of pollution - on a daily basis;
- quantities of waste by type generated and handed over to authorised operators by the contractor - on a monthly basis;
- airborne dust concentrations - on a monthly basis;
- quantities of water used and discharged - on a monthly basis;

Washing of equipment or dump trucks on site is strictly prohibited, as wash water is typically alkaline and may be contaminated with petroleum products (oils, fuels). In order to eliminate the danger of infestation of the soil and thus the water of surface water bodies with petroleum products, it is necessary to properly maintain the machinery and to carry out oil changes in special stations for such operations. As mentioned before, fuels and chemicals must be stored in sealed containers.

In order to eliminate the risk of surface water pollution, the teams of workers must clean their work zones at the end of each day and deposit household waste in designated bins.

Works carried out as part of the site organisation must not adversely affect other existing works or networks in the area. Once the basic works are completed, the site organisation will be dismantled and the land will be restored to its original use.

2.4.3. Raw materials used for the execution of works the works

During the works, mineral aggregates (crushed stone, ballast, gravel, sand), earth for backfilling will be used.

Works on the Argeș river

In order to realise the navigable canal on the Argeș River, a total excavation volume of about 16.8

million $m^3$is to be carried out along the entire length of the Argeș River, of which dredging totals about 5.5 million m^3.

The excavations require successive diversions of the current course of the river, within the limits of the river's drainage section, without affecting agricultural or forest areas.

For other works, such as drainage and front collector, connection of tributary valleys, crossings over the river, access roads to the development objectives, etc., a volume of about 7.1 million m^3 will be excavated.

The volume of the dams still to be built along the Argeș river reach a total of 8.5 million m^3, and the fills for other works about 3.1 million m^3.

It should be noted that the longitudinal dams foreseen as a result of the diversion of the Argeș river will be built with materials from the excavations resulting from the deepening of the riverbed and the regularisation of the Argeș river course.

The non-homogeneous geotechnical characteristics of the materials resulting from the excavations, namely: alternating sands with small gravels and sandy clays to be used in the dams, as well as the unfavourable characteristics in terms of permeability of the base layers of the dams, require measures to waterproof the slopes on the water side and to build cut-off walls to reduce exfiltration, as well as other measures to abstract and train excess water.

The excavation slopes and those of the dams were protected using different solutions across the reaches and segments, taking into account the geological, geotechnical, and hydrogeological conditions of each area

In determining the solutions for the defence, protection and reinforcement of slopes, account was taken of the water level in relation to the adjacent land, the stresses to which the works are subject, and the diversity of ground conditions over the length of the river development area.

On the reaches for the river development, the following were provided:

- defences at the foot of the slope to ensure stability during the free discharge of water, with fascine mattresses, raw rockfill prism, or flexible precast concrete mattresses covered with raw stone, on a ballast drainage layer;
- defences on the inner slopes of the dams to protect these slopes against hydrostatic and hydrodynamic stresses. They are made of drainage layers, reverse filter, over which a lining is executed in the form of an impermeable revetment (monolithic concrete) or pervious wall (prefabricated slabs), depending on the water level of the developed river in relation to the adjacent land.

The separation of the defences under water from those on dry land is made by a simple cast-in-place concrete beam.

In the sectors where the water level in the project's reaches exceeds the level of the surrounding land, with possible exfiltration and flooding of the neighbouring land, impervious protection with concrete slabs poured on the slopes has been provided. Whilst where the water level is below the natural ground level, the protection of the slopes above the water level consists of a pervious solution, made of prefabricated slabs.

Along the course of the Dâmbovița river

The realisation of the navigable fairway on the Dâmbovița river implies an excavation volume estimated at 13.9 million m^3, of which about 0.4 million m^3 are dredging works.

The volume of the dykes along the development totals about 11.3 million ^{3}, and 1.3 million m^3 is fill for other works, including covering / greening of stockpiles of contaminated material dredged from the current course of the river.

The concrete revetments on the inner slopes of the Dâmbovița river development total 837 thousand m^2, the cut-off walls to prevent seepage have a total area of about 731 thousand m^2, and the concrete

foot wall at the base of the slopes has a total volume of 46.3 thousand m^3.

At the two hydrotechnical nodes on the Dâmbovița river, a total volume of concrete and reinforced concrete of about 193 thousand m^3 will be poured and over 4.5 thousand tonnes of equipment and metal constructions will be installed.

The raw materials and materials will be stored in the Production Base, in specially equipped warehouses.

- ***Aggregates, sand and ballast*** are stored in above-ground paddocks, separated by sort. It is recommended to cover fine aggregates such as sand, fine asphalt aggregates;
- ***Fuels*** are stored in sealed, aboveground or partially underground tanks. The number of tanks will depend on their capacity and the amount of fuel required to be stored, according to the programme of works.
- The ***cement-based concrete*** will be prepared in specialised plants within the site organisation or will be transported by specific means of transport from concrete plants in the area of the works
- ***Precast concrete materials*** will be manufactured according to the specified dimensions and may be sourced from locations where specialised factories exist
- ***Paints and thinners intended for markings*** will be brought to the site in airtight containers from which they will be unloaded into the specific machinery for their application.
- ***The fuelling of machinery and means of transport*** will be carried out by road tankers, whenever necessary (exclusively for small machinery at the working areas). The machinery to be used will be brought to the site in working order, with technical inspections done and lubricant changes. Lubricant changes will be carried out after each working season in specialised workshops, where hydraulic and transmission oil changes will also be performed. Where maintenance or replacement of car batteries is necessary, this will not be carried out on site, but in specialised workshops within the site organisations, where tyre changes will also be made.

It should be noted that this information is of a general nature, as it is up to the Contractor to decide how they will set up the Site Organisation, Production Base, including warehouses for raw materials, materials, etc.

Quarries to extract material for dykes

In order to carry out the works that are the subject of this report, the raw materials will be brought in from quarries located close to the site (Fig. 11):

C1: X = 613519.1110
Y = 304905.2755
C2: X = 615568.7434
Y = 306035.0536
C3: X = 613261.0054
Y = 306289.6862
C4: X = 615645.1809
Y = 307086.3258
C5: X = 613239.5567
Y = 308066.7902
C6: X = 612864.8373
Y = 308966.2281



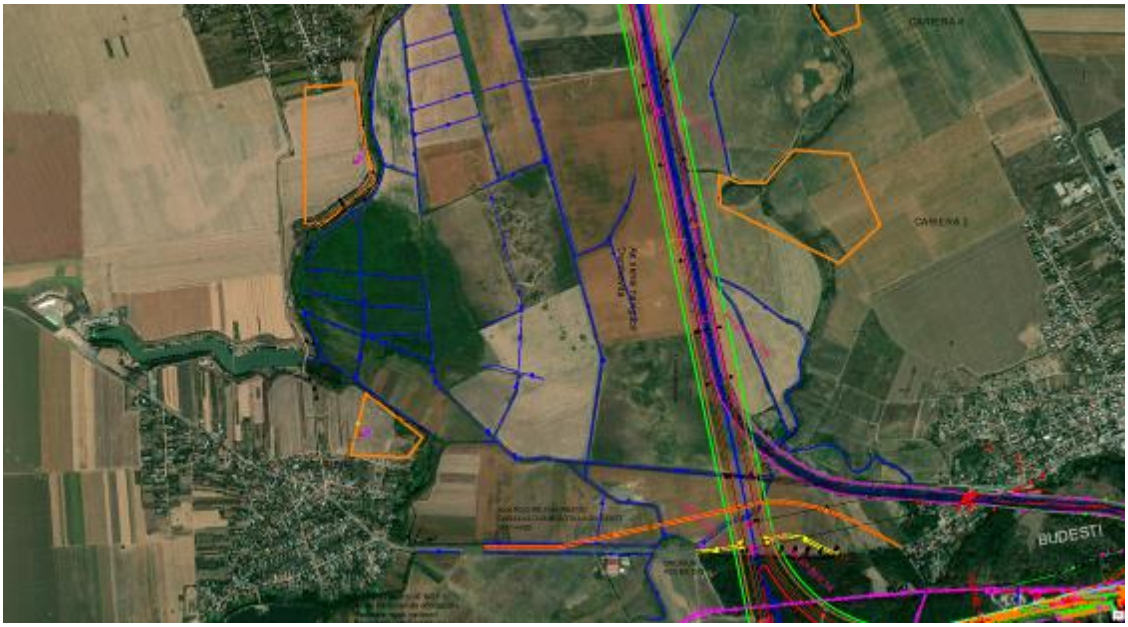

BUDESTI



Figure no. 11 - Location of the 6 quarries in the project area on the Dâmbovița river

Dumps for storage of material for the purpose of greening

The dredged material will be disposed of in 3 dumps (Fig. 12-13):

Dump 1: X = 615751.4371
Y = 307843.0801
Dump 2 X = 603640.2855
Y = 322067.4496;
Dump 3: X = 608975.4305
Y = 315748.2674

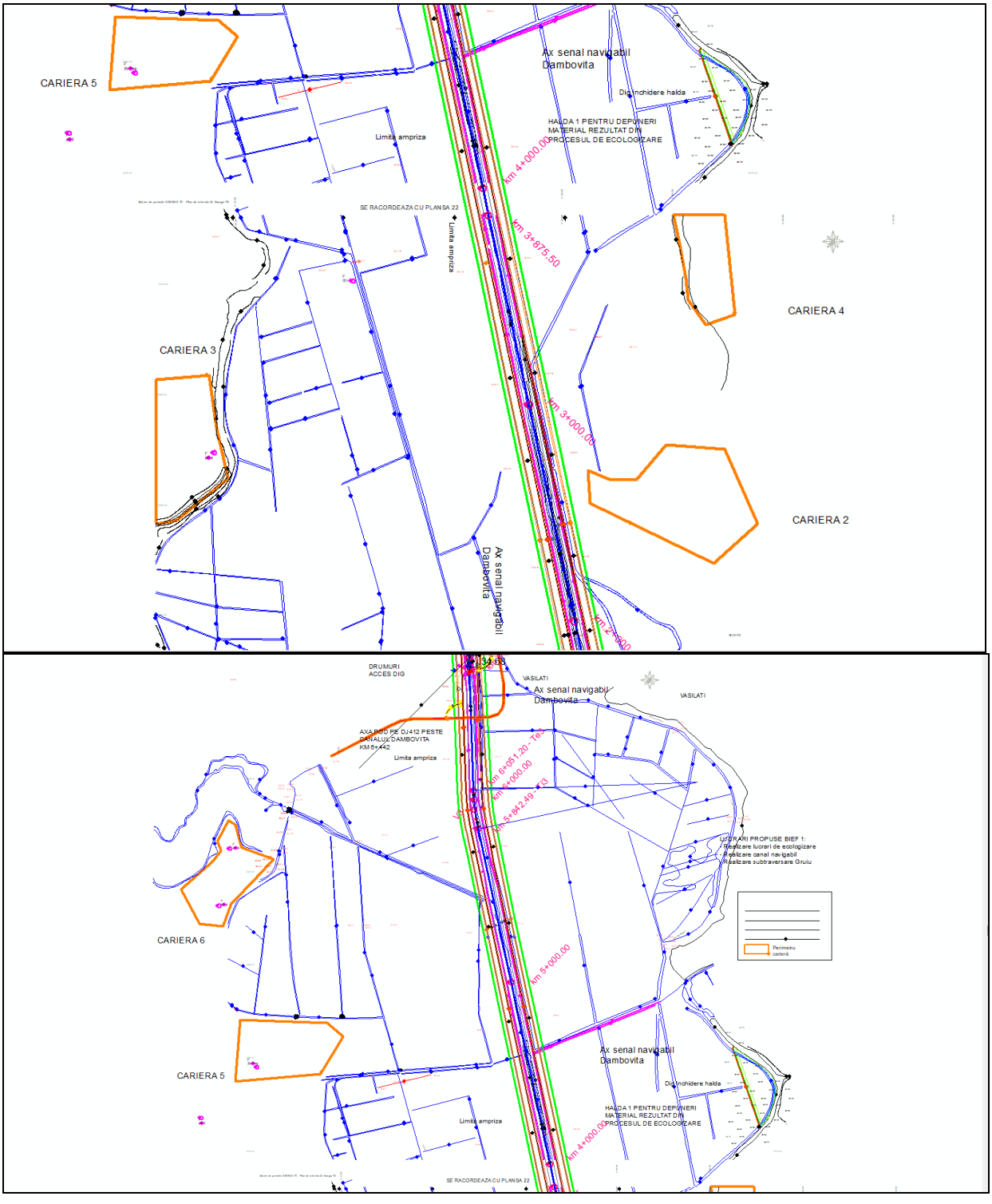


Figure no. 12 - Location of damp 1 in the project area on the Dâmbovița river

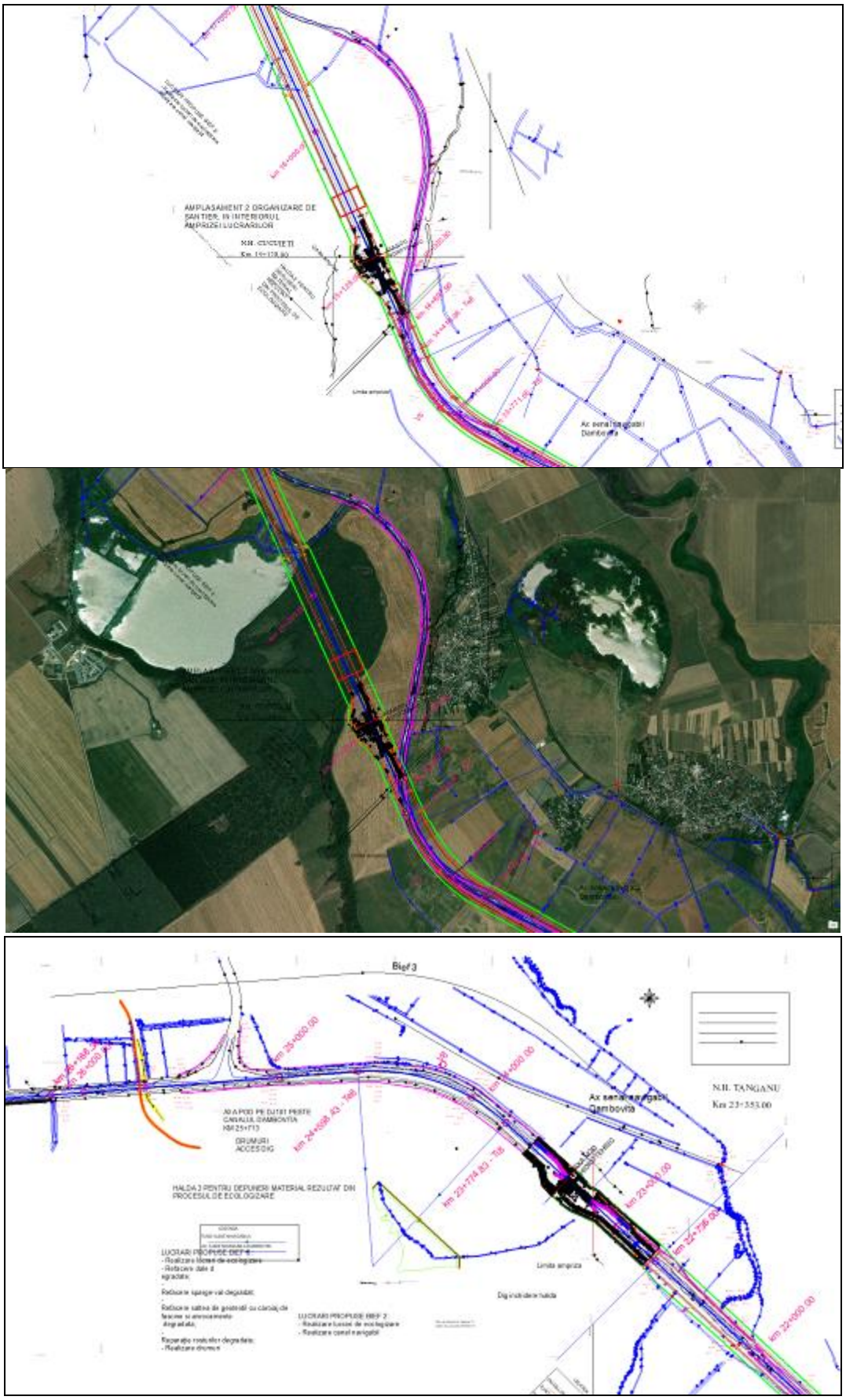




Figure no. 13 - Location of damp 2 - Tătarul pond and dump 3 - HN of Tânganu in the project area on the Dâmbovița river

2.5 Main features of the operating period

2.5.1. Main technical characteristics and capacities provided

The **navigable waterway** - has a length of 73 km on the Argeș river and takes up a difference in level of 53 m through 4 hydrotechnical nodes (HNs), and on the Dâmbovița river a length of 31 km with a difference in level of 14.60 m, taken up by 2 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and 40.0 m on the Dâmbovița river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.

The main technical characteristics and capacities provided will be mainly (mentioned in the Feasibility Study of 2012) those endorsed by the Technical and Economic Committee of the Ministry of Transport and Infrastructure by Approval No 71/80 of 19 July 2012 and by the Interministerial Council for the Approval of Public Works of National Interest with Approval No 42 of 17 August 2012, as follows:

No.	*Technical specifications (capacities)*	*M.U.*	*Argeș*	*Dâmbovița*

No.	*Technical specifications (capacities)*	*M.U.*	*Argeș*	*Dâmbovița*
1	Total length of the complex control works	Km	82.912	30.485
2	Length improved for navigation	Km	73.289	30.485
3	Reference convoy: - barge having a capacity of	 tons	 2000	
	- pusher with a power of - access for vessels travelling on European inland waterways with: o total length o width o draught (load draught)	CP m m m	800 110.00 11.40 3.00	
4	The number of locks in hydrotechnical nodes		4 twinned locks	2 simple locks
	Features of the lock chamber: - net length - net width - minimum depth at sill	 m m m	 130.00 12.50 4.75	
5	Waterway traffic capacity	mil. tonnes / year	24.00	
6	Bucharest ports		1 Decembrie, at km 72+000 on Argeș river	Glina, at km 30+235 on Dâmbovița river
	- port platform area - area intended for extension - total operational berths - technical berths + bunkering - passenger berths + tourist port - waiting areas - multifunctional building o built area o gross area - port traffic capacity	m^2 m^2 m m m m m^2 m^2 million tonnes / year	221,000 115,000 1,580 250 215 435 2,350 4,900 20	72,500 67,500 300 150 115 220 4
7	Port of Oltenița		at km 0+500 on the Argeș river and at km 431+850 on the Danube	
	- port platform area - area intended for extension - total operational berths - passenger berths + tourist port - waiting areas - convoy assembly-disassembly areas - multifunctional building o built area o gross area - port traffic capacity	m^2 m^2 m m m m m^2 m^2 million tonnes / year	73000 192000 310 200 220 350 1195 2305 3.0	
8	Hydroelectric power plant - installed power - electricity production	 MW GWh/year	 23.01 109.75	 1.41 16.6

No.	*Technical specifications (capacities)*	*M.U.*	*Argeș*	*Dâmbovița*
9	Overflow weir - tainer gates - dimensions	Number of open. m	3 at HN1, HN2 2 at HN3, HN4 10x5.75	3 at HN of Cucuieți and HN of Tânganu 8 x 3.50
10	Water supply for irrigation of agricultural land	ha	150000	
11	Possibility of fish farms on the surface	ha	1250	
12	Favourable influences on microclimate - water body over an area exceeding	ha	4000	

2.5.2. Vessel traffic management

The need to implement a vessel traffic management and shipping information system on the two developed rivers stems from the River Information Services Directive - RIS 44/EC/2005 - on harmonised river information services (RIS) on inland waterways in the Community.

The system - harmonised with the RIS Directive and associated documents - will be integrated into the Danube system and structured as a regional system, alongside the RoRis system on the Danube-Black Sea Canal currently under construction. It will have additional functions to that of the Danube, related to the management of the development works on Argeș and Dâmbovița rivers. All traffic management and information applications will be fully compatible with those of the RoRis system on the Danube and will have a structure and graphical interface with that of the direct beneficiary - C.N. Administrația Canalelor Navigabile SA Constanța and the one implemented for the accounting and financial management of the beneficiary.

The system has a hierarchical structure consisting of a central dispatcher located in the administration building (assimilated to the RoRis regional centre) and local dispatchers (assimilated to the local RoRis centres) located in the buildings on the platform of the ports of the development, i.e. in the control towers of the locks.

At the central dispatcher the following equipment will be available: electronic chart with vessel visualisation (ECDIS - Electronic Chart Display and Information System), electronic notices, electronic reporting and voyages, transit charging, traffic statistics, VHF communication, video monitoring (CCTV - Closed Circuit Television).

In the dispatchers at the hydrotechnical nodes, the following equipment will be available: lock management, electronic chart and visualisation of vessels (ECDIS), VHF communication, video monitoring (CCTV).

VHF communication and video monitoring (CCTV) will be available in the port dispatchers.

The central dispatcher in the Administration building in the port of 1 Decembrie will have access to the VHF stations of any local centre of C.N.A.C.N. S.A. Also, all VHF calls (local or from the central dispatch) will be stored at the central dispatcher.

The system is located along the Argeș and Dâmbovița waterways, on land owned by the Romanian state, in the buildings and constructions related to the planned development works.

The overall system structure includes: high-capacity, high-speed, proprietary fibre optic communications network; radio channel communications network for maximum redundancy; closed-circuit video monitoring system; Automatic Identification System (AIS) radio communications network for vessel position information at any time; interfaces with existing RoRIS system; interfaces with applications of C.N. A.C.N. S.A.

Thanks to the presence of two communication networks - data and voice - one fibre optic and the other via radiolink, the system offers the highest availability with increased redundancy compared to other variants. The system also allows central video monitoring for all camera locations, both in ports and at hydrotechnical nodes.

The system has a hierarchised structure, as set out below.

- The central dispatcher located in the combined building on the platform of the port of Bucharest - 1 Decembrie (assimilated with the RoRIS regional centre) where the following applications will be available: Electronic Chart Display and Information System (ECDIS), electronic notices, electronic reporting and voyages, transit charging, traffic statistics, VHF communication, video monitoring (CCTV - Closed Circuit Television).
- The local dispatcher centres at the ports of Bucharest -1 Decembrie, Bucharest - Glina and Oltenița). The applications available at these dispatch centres are: Electronic Chart Display and Information System (ECDIS), VHF communications and video monitoring (CCTV).
- The local dispatchers at the locks of the development on the Argeș river at HN 1 of Oltenița, HN2 of Budești, HN3 of Gostinari, HN4 of Copăceni and on the Dâmbovița river at HN of Cucuieți and HN of Tânganu. Available applications: lockage management, Electronic Chart Display and Information System (ECDIS), VHF communication, video monitoring (CCTV).

The system develops the following 8 services: electronic voyage reporting; notices to seafarers; vessel traffic visualisation; calamities; dangerous goods; lock management; charging/billing; vessel statistics.

The system is interfaced with: similar existing or under development systems such as: the RoRIS - Danube system; the RoRIS system on the Danube - Black Sea Canal; the beneficiary's Contafin system; the beneficiary's hydrological-weather system.

2.5.3. Other activities that may arise as a result of the project

The control works on Argeș and Dâmbovița rivers is a long-term regional development axis, and the economic and social influences in the territory, especially through objective developments and related activities create new jobs, absorbing unemployment.

From a territorial point of view, the area between the Argeș and Dâmbovița rivers, together with the riverside area on both banks, is the area that will benefit the most after the works are completed. **Logistic zones** and possibly **industrial parks** will be developed in the neighbourhood of the ports.

During the implementation phase, about. 17.100 temporary jobs will be created during the construction phase, while the permanent labour force generated during the project operation period is estimated at approx. 50 jobs.

The feasibility study also envisaged the appropriateness of the works for the development of the dam crest for the realisation and creation of infrastructure for cycling and tourist routes. Protective systems (railings/parapets) are foreseen on all the sectors designed for this purpose, as well as the realisation of accesses.

The cycle routes will allow Romania to participate in and contribute to the reconfiguration of the European network of EuroVelo cycle routes and the various international cycle routes.

2.5.4. Works planned for other uses

2.5.4.1 Irrigation

For the irrigation of the fields, 2 intakes have been foreseen in the Argeș area, from which it will be possible to irrigate, in a first phase, 10.029 ha.

Along the Dâmbovița River, 4 intakes have been planned, from which it will be possible to draw the water needed to irrigate up to 20,000 ha of land.

2.5.4.2 Dewatering - drainage systems

The complex development of the lower courses of the Argeș and Dâmbovița rivers for navigation and

other uses also involves the realisation of dewatering-drainage systems designed to ensure the sustainable development of the entire area.

With the expansion of irrigated areas, up to 30 000 ha will have to be dewatered/drained.

It should be noted that the irrigation and dewatering-drainage system has a high economic efficiency through increased production per hectare and thus a net income allowing the necessary investments to be recovered.

2.6 Decommissioning activities

According to the FS, the existing buildings on the site will be demolished or rehabilitated. The necessary demolitions of the construction works performed in the previous phase are presented in point 2.3.1. in Table 4 and refer to the objectives on the Argeș river.

Buildings or parts of buildings which, according to technical expert studies, are no longer reliable from a constructional point of view, will either be demolished or cleaned and rehabilitated.

2.7 Territorial planning

According to the Urbanism Certificate No. 132 of 24 May 2023 issued by Giurgiu County Council, the current use of the land in question is: River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses. Occupied land - estimated expropriations Giurgiu County - agricultural land on the Argeș river - 25.59 ha, forest land - 39.80 ha, land with buildings and adjoining areas - 0.48 ha, unproductive land - 62.13 ha (total 128.00 ha).

According to the Urbanism Certificate No. 54/7737 of 08 June 2023 issued by the Ilfov County Council, the land falls into the category of use of non-productive land, arable land, buildings and adjoining areas, roads, forest, Argeș and Dâmbovița river basin.

According to the Urbanism Certificate No. 29 of 16 May 2023 issued by the Călărași County Council, the land in question is located within the built-up area and/or outside the built-up area of Budești, Chirnogi, Crivăț, Curcani, Frumușani, Fundeni, Gălbinași, Mitreni, Oltenița, Plătărești, Radovanu, Șoldanu, Vasilați, Călărași County, according to the General Plan and the related Local Urbanism Regulations approved by the local councils' decisions and is of the public domain of the state and/or of the local administrative units and/or privately owned by individuals and/or legal entities. The land is located in protected areas of archaeological sites or on the list of historical monuments and in areas with partial conditional prohibition of construction, since it is a partially floodable area (outside the built-up area of Curcani commune).

According to the Urbanism Certificate No. 132 of 24 May 2023 issued by Giurgiu County Council, the land containing the plots of land outside the built-up area located in the TAUs of Mihăilești, Adunații Copăceni, Comana, Colibași, Gostinari, Izvoarele, Herăști, Hotarele, partially public domain, occupied by the complex control works to be developed on the Argeș river and expropriated pursuant to Article 4 of Decree No 242/1986 and Article 1 of Law No 255/2010, as subsequently amended and supplemented, and land in the private domain of natural and/or legal persons in the agricultural, forestry, construction and non-productive use categories outside the dams, land to be expropriated for the investment: "River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses". The land related to the investment is partially located in the protection zone of the Comana Natural Park, the Site of Community Importance "Comana" - ROSCI0043 and the Special Protection Area for birds "Comana" - ROSPA0022.

According to the Urbanism Certificate No. 54/7737 of 08 June 2023 issued by the Ilfov County Council, the site is located inside and outside the built-up area of the city of Măgurele and the communes of Vidra, 1 Decembrie, Copăceni, Dărăști-Ilfov, Cornetu, Cernica and Glina, according to the related General Planning Schemes. The land necessary for the control works on the Argeș and Dâmbovița rivers for navigation (a total area of about 42 ha in Ilfov County, as mentioned in the

application for the issuance of the urbanism certificate) is part of the public domain of the Romanian State, managed by the National Administration "Apele Romane" (Argeș and Dâmbovița basins), as well as privately owned (individuals and legal entities). The Handover Protocol concluded for the objective "River control works on the Argeș River for flood defence, irrigation and other uses" as well as for some state-owned public property assets under the administration of the Ministry of Environment and Sustainable Development - NA "Apele Romane" under the administration of the Ministry of Transport, through the Compania Naţională Administraţia Canalelor Navigabile S.A. Constanta, for the construction of a navigable waterway from Bucharest to the Danube, concluded in 2008, is presented. The site is not included in the list of historical monuments approved by the Order of the Minister of Culture No. 2828/2015. However, it is partially in the protection zone of some archaeological sites, namely in the archaeological protection zone along the Argeș river; it is affected by the water protection zone, the protection zone of an overhead power line, forest area, canals of the Land Reclamation Agency, the railway protection and safety zone (according to the regulation plans under the General Planning Scheme), the radial road 8 - Splai Expres.

2.8 Ensuring connection to utilities

2.8.1. Ensuring water supply. Discharge of wastewater

2.8.1.1 Port of 1 Decembrie

❖ ***Drinking water and fire-fighting water storage***

The source of drinking water to supply the consumers in the port premises will be a new Ø 4" drilled well, with depth H = 100 m. The well will be equipped with a submersible pump having the following characteristics: Q=6mc/h, H=85mCA, N=3kW.

The objective will be equipped with a 200 m^3 water reservoir coupled with a pumping station and a booster pump. The capacity of the reservoir has been calculated in order to preserve the intangible water reserve for firefighting with internal and external hydrants, as well as the potable water reserve for supplying ships and consumers within the port premises.

The pumping station and the booster pump will be equipped with:

- ✓ pumping unit for domestic water consumption with the following characteristics: Q=20mc/h H=58mCA N=3x2.2kW
- ✓ fire pumping unit with Q=54mc/h H=58mCA N=3x5.5kW
- ✓ base pump with Q=12mc/h H=7mCA N=1 kW
- ✓ axial fan wit Q=200m^3/h; H=8mmCA; N=0.3 kW
- ✓ booster pump container 1000 l.
- ✓ water treatment plant.

❖ ***Water networks***

The water distribution network will be common for domestic and fire purposes, will be about 1900 m long and will be made of high density polyethylene pipes with a diameter of 50÷125 mm. The water network will supply the multi-purpose building, the workshop plus sanitary facility building and the facility for the reception and treatment of ship-generated waste.

Around the multifunctional building, the water network will be of the ring type. The inner hydrants Dn 50 and the outer hydrants Dn 65 will be supplied from the fire ring.

For the supply of water to the ships, quay manholes with Dn 65 hydrants have been provided, located in the area of the ships' waiting area.

The use of raw water from the Argeș river was envisaged as a back-up option to firefighting. For this purpose, a shore outlet in the northern area and a 15 l/s motor pump have been provided.

❖ ***Interior plumbing in the multifunctional building***

The multi-purpose building is equipped with sanitary facilities with hot and cold water. The cold water to the sanitary facilities will be supply from the water network designed within the port. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building.

The internal hydrant installation is designed to provide a jet of 2.5 litres per second. Water will be supplied to the hydrant system from the fire ring main around the building.

Domestic wastewater from the sanitary facilities will be discharged through D=110mm connections to the external domestic sewerage network.

The rainwater from the roof of the building will be collected by Dn 100 mm terrace receptors, channelled and discharged to the external storm sewer network through Φ 110 mm pipes.

❖ ***Interior plumbing in the workshop building + sanitary facility***

The workshop building is equipped with sanitary facilities with hot and cold water.

The cold water to the sanitary facilities will be supply from the water network designed within the port through the local pumping station and booster pump.

Hot water for sanitary facilities will be prepared locally with electric boilers.

The domestic wastewater from the sanitary facilities will be discharged through connections D=110mm to the one-piece sewage treatment plant with a capacity of 4 m^3/day.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

In the area of the multifunctional building there is a Dn 200 gravity domestic sewerage network, which collects the domestic wastewater from the building and transports it to the mechanical-biological treatment plant with a capacity of 15 m^3/day.

The length of the sewerage network in the multifunctional building area will be 300 m.

The mechanical-biological treatment plant has a capacity of 15 m^3/day and consists of:

- pumping hygiene manhole equipped with two submersible sewage pumps with Q=9m^3/h, H=5 mCA
- treatment module Q= 15 m^3/day
- inspection manhole.

The treated water will be discharged by gravity into the Argeș River through the outfall.

In the area of the workshop building there is a Dn 200 gravity domestic sewerage network, which collects the domestic wastewater from the buildings in the area and transports it to the mechanical-biological treatment plant with a capacity of 4 m^3/day.

The length of the sewerage network in the workshop building area will be 150 m.

The mechanical-biological treatment plant has a capacity of 4 m^3/day and consists of:

- pumping hygiene manhole equipped with two submersible sewage pumps with Q=2m^3/h, H=5 mCA
- treatment module Q= 4 m^3/day;
- inspection manhole.

The treated water will be discharged by gravity into the Argeș River through the outfall.

Water discharged into the emissary will fulfil the quality conditions of NTPA 001/2002 norms.

❖ ***Petroleum product separator + Rainwater sewerage networks***

Gravity rainwater drainage networks with a Dn of 300-400 mm, with a total length of 450 m, have been

provided. These networks collect rainwater from the roofs of the buildings and the concrete platforms (car parks) in their proximity. The stormwater discharge will be gravitational, into the Argeș River, through two outfalls (one in the multifunctional building area and one in the workshop area).

Prior to discharge into the emissary, rainwater from the car parking decks will be passed through petroleum product separators. Two oil product separators have been provided, one in the multifunctional building area and one in the workshop area).

❖ ***Facility for the reception and treatment of ship-generated waste***

The station for the reception, treatment and discharge of waste products from ships is a fenced enclosure measuring 52x12m, in which the waste will be stored:

- container-type sanitary facility connected to water and sewerage networks;
- garbage handling point - for the collection and disposal of waste from ships by type (plastic, paper, household waste);
- collection-treatment system for bilge water;
- domestic wastewater collection and treatment system.

The bilge water collection-treatment system consists of the following components:

- a 12 m^3 bilge water reception basin;
- petroleum product separating module;
- 4 m^3 oil collection tank;
- collection - recirculation basin for polluted water of about 4.5 m^3.

Bilge water from the ships is pumped into the reception basin. The sloping-bottom basin allows the collection of floating particles at the bottom and pre-separated oil at the top.

The oil-water mixture collects in the middle part of the tank and is treated in the separator in the second container, which has a processing capacity of about 5 m^3/h.

Separated light products are collected in a tank of about 4 m^3, from where they are sent for recovery. Treated water that does not fulfil the discharge parameters to the outfall is collected in a basin of about 4.5 m^3 and reintroduced into the treatment process. Automatic reinforcements are operated pneumatically using a compressor.

The domestic wastewater treatment system consists of:

- reception basin with a capacity of about 5.0 m^3;
- wastewater treatment module.

The reception basin which is equipped with all necessary couplings and valves. The system has a treatment capacity of about 5 m^3/day, and the treated water will be disinfected with chlorine at discharge. The unit works fully automatically.

The treated water will be discharged into the Argeș river, fulfilling the discharge conditions of the NTPA 001/2002.

A fixed shore inlet will be provided, to which the sewage treatment plants will be connected by a hose.

2.8.1.2 Port of Oltenița

The Port of Oltenița includes the following objects within the water supply and sewerage works:

- multifunctional building (river station + administration);
- workshop + sanitary facility building;
- water storage tank;
- monobloc treatment plant Q=15m^3/day;

- oil product separator for the platform.

❖ ***Drinking water and fire-fighting water storage***

The source of drinking water to supply the consumers in the port premises will be a new Ø 4" drilled well, with depth H = 100 m. The well will be equipped with a submersible pump having the following characteristics: Q=6mc/h, H=85mCA, N=3kW.

The objective will be equipped with a 200 m^3 water reservoir coupled with a pumping station and a booster pump. The capacity of the reservoir has been calculated in order to preserve the intangible water reserve for firefighting with internal and external hydrants, as well as the potable water reserve for supplying ships and consumers within the port premises.

The pumping station and the booster pump will be equipped with:

- pumping unit for domestic water consumption with the following characteristics: Q=20mc/h H=58mCA N=3x2.2kW
- fire pumping unit with Q=40mc/h H=58mCA N=2x5.5kW
- base pump with Q=12mc/h H=7mCA N=1 kW
- axial fan wit Q=200m^3/h; H=8mmCA; N=0.3 kW
- booster pump container 1000 l
- water treatment plants.

❖ ***Water networks***

The water distribution network will be common for domestic and fire purposes, will be about 600 m long and will be made of high density polyethylene pipes with a diameter of 50÷125 mm. The water network will supply the multifunctional building and the workshop + sanitary facility building.

Around the multifunctional building, the water network will be of the ring type. The inner hydrants Dn 50 and the outer hydrants Dn 65 will be supplied from the fire ring.

For the supply of water to the ships, quay manholes with Dn 65 hydrants have been provided, located in the area of the ships' waiting area.

The use of raw water from the Argeș river was envisaged as a back-up option to firefighting. A shore inlet and a 10 l/s motor pump have been provided for this purpose.

❖ ***Interior plumbing in the multifunctional building***

The multi-purpose building is equipped with sanitary facilities with hot and cold water. The cold water to the sanitary facilities will be supply from the water network designed within the port. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building.

The internal hydrant installation is designed to provide a jet of 2.5 litres per second. Water will be supplied to the hydrant system from the fire ring main around the building.

Domestic wastewater from the sanitary facilities will be discharged through D=110mm connections to the external domestic sewerage network.

The rainwater from the roof of the building will be collected by Dn 100 mm (12 pcs) terrace receptors, channelled and discharged to the external storm sewer network through Φ 110 mm pipes.

❖ ***Interior plumbing in the workshop building + sanitary facility***

The workshop buildings are equipped with hot and cold sanitary facilities.

The cold water to the sanitary facilities will be supply from the water network designed within the port.

Hot water for sanitary facilities will be prepared locally with electric boilers.

Domestic sewage from sanitary facilities will be discharged through pumping stations to the treatment plant.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

The domestic wastewater from the multifunctional building will be collected through a Dn 200 gravity domestic sewerage network, which transports it to the mechanical-biological treatment plant.

A sewage pumping station was foreseen for each workshop building, which will pump the wastewater to the treatment plant.

The mechanical-biological treatment plant has a capacity of 15 m^3/day and consists of:

- pumping hygiene manhole, V=9m^3, equipped with two submersible sewage pumps with Q=9m^3/h, H=5 mCA
- treatment module Q= 15 m^3/day
- inspection manhole.

The treated water will be discharged by gravity into the Argeș River through the outfall.

The total length of the gravity sewer networks will be 300 m.

The total length of the pressurised sewer networks will be 250 m.

Water discharged into the emissary will fulfil the quality conditions of NTPA 001/2002 norms.

❖ ***Petroleum product separator + Rainwater sewerage networks***

In the southern area, gravity storm sewerage networks with Dn 300-400mm, with a total length of 450m, have been planned. These networks collect rainwater from the roof of the multi-functional building and rainwater from the car park platforms. Rainwater will be discharged gravitationally into the Argeș River through the outfall. Prior to discharge into the emissary, rainwater from the car parking decks will be passed through a petroleum product separator.

2.8.1.3 Port of Glina

The Port of Bucharest - Glina includes the following objects included in the water supply and sewerage works:

- multifunctional building (river station + administration);
- workshop + sanitary facility building;
- water storage tank;
- monobloc treatment plant Q=15m^3/day;
- petroleum products separator;
- facility for the reception and treatment of ship-generated waste - located in the area of the ships' waiting front.

❖ ***Drinking water and fire-fighting water storage***

The source of drinking water to supply the consumers in the port premises will be a new Ø 4" drilled well, with depth H = 100 m. The well will be equipped with a submersible pump having the following characteristics: Q=6mc/h, H=85mCA, N=3kW.

The objective will be equipped with a 200 m^3 water reservoir coupled with a pumping station and a booster pump. The capacity of the reservoir has been calculated in order to preserve the intangible water reserve for firefighting with internal and external hydrants, as well as the potable water reserve for supplying ships and consumers within the port premises.

The pumping station and the booster pump will be equipped with:

- pumping unit for domestic water consumption with the following characteristics: Q=20mc/h H=58mCA N=3x2.2kW
- fire pumping unit with Q=54mc/h H=58mCA; N=3x5.5kW
- base pump with Q=12mc/h H=7mCA N=1 kW
- axial fan with Q=200m3/h; H=8mmCA; N=0.3 kW
- booster pump container 1000 l
- water treatment plants.

❖ ***Water networks***

The water distribution network will be common for domestic and fire purposes, will be about 900 m long and will be made of high density polyethylene pipes with a diameter of 50÷125 mm. The water network will supply the multi-purpose building, the workshop plus sanitary facility building and the facility for the reception and treatment of ship-generated waste. Around the multifunctional building, the water network will be of the ring type. The inner hydrants Dn 50 and the outer hydrants Dn 65 will be supplied from the fire ring. For the supply of water to the ships, quay manholes with Dn 65 hydrants have been provided, located in the area of the ships' waiting area. The use of raw water from the Argeș river was envisaged as a back-up option to firefighting. A shore inlet and a 15 l/s motor pump have been provided for this purpose.

❖ ***Interior plumbing in the multifunctional building***

The multi-purpose building is equipped with sanitary facilities with hot and cold water. The cold water to the sanitary facilities will be supply from the water network designed within the port. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building. The internal hydrant installation is designed to provide a jet of 2.5 litres per second. Water will be supplied to the hydrant system from the fire ring main around the building.

Domestic wastewater from the sanitary facilities will be discharged through D=110mm connections to the external domestic sewerage network.

The rainwater from the roof of the building will be collected by Dn 100 mm terrace receptors, channelled and discharged to the external storm sewer network through Φ 110 mm pipes.

❖ ***Interior plumbing in the workshop building + sanitary facility***

The multi-purpose building is equipped with sanitary facilities with hot and cold water. The cold water to the sanitary facilities will be supply from the water network designed within the port through the local pumping station and booster pump.

Hot water for sanitary facilities will be prepared locally with electric boilers.

Domestic wastewater from the sanitary facilities will be discharged through D=110mm connections to the external domestic sewerage network.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

The domestic wastewater from the multifunctional building will be collected through a Dn 200 gravity domestic sewerage network, which transports it to the mechanical-biological treatment plant, with a capacity of 15 m^3/day.

A wastewater pumping station has been planned in the workshop area, which will pump wastewater from the workshop building to the treatment plant.

The mechanical-biological treatment plant consists of:

- pumping hygiene manhole, V=9m^3, equipped with two submersible sewage pumps with Q=9m^3/h, H=5 mCA
- treatment module Q= 15 m^3/day
- inspection manhole.

The treated water will be discharged by gravity into the Argeș River through the outfall.

The total length of the sewer networks will be 400 m.

Discharged water will fulfil the discharge conditions laid down in NTPA 001/2002.

❖ ***Petroleum product separator + Rainwater sewerage networks***

In the southern area, gravity storm sewerage networks with Dn 300-400mm, with a total length of 450m, have been planned. These networks collect rainwater from the roof of the multi-functional building and rainwater from the car park platforms. Rainwater will be discharged gravitationally into the Argeș River through the outfall. Prior to discharge into the emissary, rainwater from the car parking decks will be passed through a petroleum product separator.

❖ ***Facility for the reception and treatment of ship-generated waste***

The station for the reception, treatment and discharge of waste products from ships is a fenced enclosure measuring 52x12m, in which the waste will be stored:

- container-type sanitary facility connected to water and sewerage networks;
- garbage handling point - for the collection and disposal of waste from ships by type (plastic, paper, household waste);
- collection-treatment system for bilge water;
- domestic wastewater collection and treatment system.

The bilge water collection-treatment system consists of the following components:

- a 12 m^3 bilge water reception basin;
- petroleum product separating module;
- 4 m^3 oil collection tank;
- collection - recirculation basin for polluted water of about 4.5 m^3.

Bilge water from the ships is pumped into the reception basin. The sloping-bottom basin allows the collection of floating particles at the bottom and pre-separated oil at the top.

The oil-water mixture collects in the middle part of the tank and is treated in the separator in the second container, which has a processing capacity of about 5 m^3/h.

Separated light products are collected in a tank of about 4 m^3, from where they are sent for recovery. Treated water that does not fulfil the discharge parameters to the outfall is collected in a basin of about 4.5 m^3 and reintroduced into the treatment process. Automatic reinforcements are operated pneumatically using a compressor.

The domestic wastewater treatment system consists of:

- reception basin with a capacity of about 5.0 m^3;
- wastewater treatment module.

The reception basin which is equipped with all necessary couplings and valves. The system has a treatment capacity of about 5 m^3/day, and the treated water will be disinfected with chlorine at discharge. The unit works fully automatically.

The treated water will be discharged into the Argeș river, fulfilling the discharge conditions of the NTPA 001/2002.

A fixed shore inlet will be provided, to which the sewage treatment plants will be connected by a hose.

2.8.1.4 HN 1 Oltenița

❖ ***Water supply connection***

In order to ensure the necessary water flows for water supply, the project provides a connection to the public network in Oltenița.

The indicative volume of water required and specific average flow rates will be adopted in accordance with SR 1343-1-2006, Normative I 9 - 2022 and NP133/2022:

Average daily flow rate:	Qday aver = 12.07 m3/day = 0.50 m3/day = 0.13 l/s
Maximum daily flow rate:	Qday max = 15.69 m3/day = 0.65 m3/h = 0.18 l/s
Maximum hourly flow rate:	Qh max = 1.88 m3/h = 0.52 l/s

❖ ***Household domestic water storage tank***

Water will be pumped by: a water pumping unit with 2 pumps (1 active and 1 standby pump) fully equipped. (closing and regulating fittings, protection against lack of water, electrical command and control switchboard, etc.), with the following characteristics: Q = 20 mc/h, H = 58 mCA.

Pumping stations will be equipped as follows:

- base pump with Q=12mc/h H=7mCA;
- axial fan with Q=200m3/h; H=8mmCA;
- booster pump container 1000 l;
- water treatment plant.

❖ ***Water networks***

Water flow through the distribution network will be ensured by pumping. The diameter of the distribution pipe will be minimum D32 [mm] and maximum D110 [mm] PN10 with an approximate length of L=950m. The water network will supply the operational block section.

❖ ***Internal plumbing in the operational block section building***

The building is equipped with sanitary facilities equipped with hot and cold water supply. Cold water will be supplied to the sanitary facilities from the water network designed in the premises of HN1 of Oltenița. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building.

Domestic wastewater from the sanitary facilities will be discharged through D=200mm connections to the external domestic sewerage network.

Meteoric waters from the roof of the building will be collected by DN100 mm terrace collectors, channelled and discharged to the external storm sewerage network through DN200 mm pipes.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

For sizing, the maximum hourly flow rate from water use per type of consumption (sanitary objects in the operational block building) is considered:

Average daily flow rate used:	Qus day aver = 12.07 m3/day = 0.50 m3/day = 0.13 l/s
Maximum daily flow rate used:	Qus day max = 15.69 m3/day = 0.65 m3/h = 0.18 l/s
Maximum hourly flow rate used:	Qus ho max = 1.88 m3/h = 0.52 l/s

In the area of the operational block building there is a DN 200 gravity domestic sewerage network, which collects the domestic wastewater from the building and transports it to the mechanical-biological

treatment plant with a capacity of 15 m^3/day.

The length of the sewerage network in the multifunctional building area will be 300 m.

The mechanical-biological treatment plant has a capacity of 15 m^3/day and consists of:

- pumping hygiene manhole equipped with two submersible sewage pumps with Q=9m3/h, H=5 mCA
- treatment module Q= 15 m3/day
- inspection manhole.

The treated water will be discharged by gravity into the Argeș River through the outfall.

Water discharged into the emissary will fulfil the quality conditions of NTPA 001/2002 norms.

❖ ***Petroleum products (hydrocarbons) separator and meteoric sewerage networks***

Gravity rainwater drainage networks with a DN of 300-400 mm, with a total length of 450 m, have been provided. These networks collect rainwater from the roofs of the buildings and the concrete platforms (car parks) in their proximity. Rainwater will be discharged gravitationally into the Argeș River through the outfall.

Prior to discharge into the emissary, rainwater from the car parking decks will be passed through petroleum product separators.

The treated water will be discharged into the Argeș river, fulfilling the discharge conditions of the NTPA 001/2002.

❖ ***Sizing elements***

Cold Water Network Sizing Calculation					
No	**Nr. of objects**	**0,7E1**	**E2**	**E**	**q_c**
					[l/s]
1.1	1WC		0.5	0.5	0.20
1.2	1LV+1WC	0.70	0.50	1.20	0.20
1.3	1LV+1WC	1.40	0.50	1.90	0.21
1.4	2LV+1WC	2.10	0.50	2.60	0.25
1.5	2LV+1WC+1SV	2.10	0.50	2.60	0.25
1.6	2LV+1WC+2SV	2.80	0.50	3.30	0.29
1.16	4LV+4WC+5SV	6.30	4.00	10.30	**0.52**

2.8.1.5 HN 2 Budești

❖ ***Water supply connection***

In order to ensure the necessary water flows for water supply, the project provides a connection to the public network in Budești.

The indicative volume of water required and specific average flow rates will be adopted in accordance with SR 1343-1-2006, Normative I 9 - 2022 and NP133/2022:

- Average daily flow rate: Qday aver = 12.07m^3/day = 0.50 m^3/day = 0.13 l/s
- Maximum daily flow rate: Qday max = 15.69m^3/day = 0.65 m^3/day = 0.18 l/s
- Maximum hourly flow rate: Qho max = 1.88 m^3/h = 0.52 l/s

❖ ***Household domestic water storage tank***

Water will be pumped by: a water pumping unit with 2 pumps (1 active and 1 standby pump) fully equipped. (closing and regulating fittings, protection against lack of water, electrical command and control switchboard, etc.), with the following characteristics: Q = 20 mc/h, H = 58 mCA.

Pumping stations will be equipped as follows:

- base pump with Q=12mc/h H=7mCA;
- axial fan with Q=200m3/h; H=8mmCA;
- booster pump container 1000 l;
- water treatment plant.

❖ ***Water networks***

Water flow through the distribution network will be ensured by pumping. The diameter of the distribution pipe will be minimum D32 [mm] and maximum D110 [mm] PN10 with an approximate length of L=1400m. The water network will supply the operational block section.

❖ ***Internal plumbing in the operational block section building***

The building is equipped with sanitary facilities equipped with hot and cold water supply. Cold water will be supplied to the sanitary facilities from the water network designed in the premises of HN2 of Budești. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building.

Domestic wastewater from the sanitary facilities will be discharged through D=200mm connections to the external domestic sewerage network.

Meteoric waters from the roof of the building will be collected by DN100 mm terrace collectors, channelled and discharged to the external storm sewerage network through DN200 mm pipes.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

For sizing, the maximum hourly flow rate from water use per type of consumption (sanitary objects in the operational block building) is considered:

- Average daily flow rate used: Qus aver = 12.07 m^3/day = 0.50 m^3/day = 0.13 l/s
- Maximum daily flow rate used: Qus max = 15.69 m^3/day = 0.65 m^3/day = 0.18 l/s
- Maximum hourly flow rate used: Qus ho max = 1.88 m^3/h = 0.52 l/s

In the area of the operational block building there is a DN 200 gravity domestic sewerage network, which collects the domestic wastewater from the building and transports it to the mechanical-biological treatment plant with a capacity of 15 m3/day.

The length of the sewerage network in the multifunctional building area will be 300 m.

The mechanical-biological treatment plant has a capacity of 15 m^3/day and consists of:

- pumping hygiene manhole equipped with two submersible sewage pumps with Q=9m^3/h, H=5 mCA
- treatment module Q= 15 m^3/day
- inspection manhole.

The treated water will be discharged by gravity into the Argeș River through the outfall.

Water discharged into the emissary will fulfil the quality conditions of NTPA 001/2002 norms.

❖ ***Petroleum products (hydrocarbons) separator and meteoric sewerage networks***

Gravity rainwater drainage networks with a DN of 300-400 mm, with a total length of 450 m, have been provided. These networks collect rainwater from the roofs of the buildings and the concrete platforms (car parks) in their proximity. Rainwater will be discharged gravitationally into the Argeș

River through the outfall.

Prior to discharge into the emissary, rainwater from the car parking decks will be passed through petroleum product separators.

The treated water will be discharged into the Argeș river, fulfilling the discharge conditions of the NTPA 001/2002.

❖ ***Sizing elements***

Cold Water Network Sizing Calculation					
No	**Nr. of objects**	**0,7E1**	**E2**	**E**	**q_c**
					[l/s]
1.1	1WC		0.5	0.5	0.20
1.2	1LV+1WC	0.70	0.50	1.20	0.20
1.3	1LV+1WC	1.40	0.50	1.90	0.21
1.4	2LV+1WC	2.10	0.50	2.60	0.25
1.5	2LV+1WC+1SV	2.10	0.50	2.60	0.25
1.6	2LV+1WC+2SV	2.80	0.50	3.30	0.29
1.16	4LV+4WC+5SV	6.30	4.00	10.30	**0.52**

2.8.1.6 HN 3 if Colibași

❖ ***Water supply connection***

In order to ensure the necessary water flows for water supply, the project provides a connection to the public network in Colibași.

The indicative volume of water required and specific average flow rates will be adopted in accordance with SR 1343-1-2006, Normative I 9 - 2022 and NP133/2022:

- Average daily flow rate: Qday aver = 12.07 m3/day = 0.50 m3/day = 0.13 l/s
- Maximum daily flow rate: Qday max = 15.69 m3/day = 0.65 m3/h = 0.18 l/s
- Maximum hourly flow rate: Qh max = 1.88 m3/h = 0.52 l/s.

❖ ***Household domestic water storage tank***

Water will be pumped by: a water pumping unit with 2 pumps (1 active and 1 standby pump) fully equipped. (closing and regulating fittings, protection against lack of water, electrical command and control switchboard, etc.), with the following characteristics: Q = 20 mc/h, H = 58 mCA.

Pumping stations will be equipped as follows:

- base pump with Q=12mc/h H=7mCA;
- axial fan with Q=200m3/h; H=8mmCA;
- booster pump container 1000 l;
- water treatment plant.

❖ ***Water networks***

Water flow through the distribution network will be ensured by pumping. The diameter of the distribution pipe will be minimum D32 [mm] and maximum D110 [mm] PN10 with an approximate length of L=1200m. The water network will supply the operational block section.

❖ ***Internal plumbing in the operational block section building***

The building is equipped with sanitary facilities equipped with hot and cold water supply. Cold water will be supplied to the sanitary facilities from the water network designed in the premises of HN3 of

Colibași. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building.

Domestic wastewater from the sanitary facilities will be discharged through D=200mm connections to the external domestic sewerage network.

Meteoric waters from the roof of the building will be collected by DN100 mm terrace collectors, channelled and discharged to the external storm sewerage network through DN200 mm pipes.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

For sizing, the maximum hourly flow rate from water use per type of consumption (sanitary objects in the operational block building) is considered:

- Average daily flow rate used: Qus day aver = 12.07 m3/day = 0.50 m3/day = 0.13 l/s
- Maximum daily flow rate used: Qus day max = 15.69 m3/day = 0.65 m3/h = 0.18 l/s
- Maximum hourly flow rate used: Qus ho max = 1.88 m3/h = 0.52 l/s

In the area of the operational block building there is a DN 200 gravity domestic sewerage network, which collects the domestic wastewater from the building and transports it to the mechanical-biological treatment plant with a capacity of 15 m3/day.

The length of the sewerage network in the multifunctional building area will be 300 m.

The mechanical-biological treatment plant has a capacity of 15 m3/day and consists of:

- pumping hygiene manhole equipped with two submersible sewage pumps with Q=9m3/h, H=5 mCA
- treatment module Q= 15 m3/day
- inspection manhole.

The treated water will be discharged by gravity into the Argeș River through the outfall.

Water discharged into the emissary will fulfil the quality conditions of NTPA 001/2002 norms.

❖ ***Petroleum products (hydrocarbons) separator and meteoric sewerage networks***

Gravity rainwater drainage networks with a DN of 300-400 mm, with a total length of 450 m, have been provided. These networks collect rainwater from the roofs of the buildings and the concrete platforms (car parks) in their proximity. Rainwater will be discharged gravitationally into the Argeș River through the outfall.

Prior to discharge into the emissary, rainwater from the car parking decks will be passed through petroleum product separators.

The treated water will be discharged into the Argeș river, fulfilling the discharge conditions of the NTPA 001/2002.

❖ ***Sizing elements***

Cold Water Network Sizing Calculation					
No	**Nr. of objects**	**0,7E1**	**E2**	**E**	**q_c**
					[l/s]
1.1	1WC		0.5	0.5	0.20
1.2	1LV+1WC	0.70	0.50	1.20	0.20
1.3	1LV+1WC	1.40	0.50	1.90	0.21
1.4	2LV+1WC	2.10	0.50	2.60	0.25
1.5	2LV+1WC+1SV	2.10	0.50	2.60	0.25
1.6	2LV+1WC+2SV	2.80	0.50	3.30	0.29
1.16	4LV+4WC+5SV	6.30	4.00	10.30	**0.52**

2.8.1.7 HN 4 Copăceni

❖ ***Water supply connection***

In order to ensure the necessary water flows for water supply, the project provides a connection to the public network in Copăceni.

The indicative volume of water required and specific average flow rates will be adopted in accordance with SR 1343-1-2006, Normative I 9 - 2022 and NP133/2022:

- Average daily flow rate: Qday aver = 12.07 m3/day = 0.50 m3/day = 0.13 l/s
- Maximum daily flow rate: Qday max = 15.69 m3/day = 0.65 m3/h = 0.18 l/s
- Maximum hourly flow rate: Qh max = 1.88 m3/h = 0.52 l/s.

❖ ***Household domestic water storage tank***

Water will be pumped by: a water pumping unit with 2 pumps (1 active and 1 standby pump) fully equipped. (closing and regulating fittings, protection against lack of water, electrical command and control switchboard, etc.), with the following characteristics: Q = 20 mc/h, H = 58 mCA.

Pumping stations will be equipped as follows:

- base pump with Q=12mc/h H=7mCA;
- axial fan with Q=200m3/h; H=8mmCA;
- booster pump container 1000 l;
- water treatment plant.

❖ ***Water networks***

Water flow through the distribution network will be ensured by pumping. The diameter of the distribution pipe will be minimum D32 [mm] and maximum D110 [mm] PN10 with an approximate length of L=1400m. The water network will supply the operational block section.

❖ ***Internal plumbing in the operational block section building***

The building is equipped with sanitary facilities equipped with hot and cold water supply. Cold water will be supplied to the sanitary facilities from the water network designed in the premises of HN4 of Copăceni. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building.

Domestic wastewater from the sanitary facilities will be discharged through D=200mm connections to the external domestic sewerage network.

Meteoric waters from the roof of the building will be collected by DN100 mm terrace collectors, channelled and discharged to the external storm sewerage network through DN200 mm pipes.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

For sizing, the maximum hourly flow rate from water use per type of consumption (sanitary objects in the operational block building) is considered:

- Average daily flow rate used: Qus aver = 12.07 m^3/day = 0.50 m^3/day = 0.13 l/s
- Maximum daily flow rate used: Qus max = 15.69 m^3/day = 0.65 m^3/day = 0.18 l/s
- Maximum hourly flow rate used: Qus ho max = 1.88 m^3/h = 0.52 l/s

In the area of the operational block building there is a DN 200 gravity domestic sewerage network, which collects the domestic wastewater from the building and transports it to the mechanical-biological treatment plant with a capacity of 15 m3/day.

The length of the sewerage network in the multifunctional building area will be 300 m.

The mechanical-biological treatment plant has a capacity of 15 m3/day and consists of:

- pumping hygiene manhole equipped with two submersible sewage pumps with Q=9m^3/h, H=5 mCA
- treatment module Q= 15 m^3/day
- inspection manhole.

The treated water will be discharged by gravity into the Argeș River through the outfall.

Water discharged into the emissary will fulfil the quality conditions of NTPA 001/2002 norms.

❖ ***Petroleum products (hydrocarbons) separator and meteoric sewerage networks***

Gravity rainwater drainage networks with a DN of 300-400 mm, with a total length of 450 m, have been provided. These networks collect rainwater from the roofs of the buildings and the concrete platforms (car parks) in their proximity. Rainwater will be discharged gravitationally into the Argeș River through the outfall.

Prior to discharge into the emissary, rainwater from the car parking decks will be passed through petroleum product separators.

The treated water will be discharged into the Argeș river, fulfilling the discharge conditions of the NTPA 001/2002.

❖ *Sizing elements*

Cold Water Network Sizing Calculation					
No	**Nr. of objects**	**0,7E1**	**E2**	**E**	**q_c**
					[l/s]
1.1	1WC		0.5	0.5	0.20
1.2	1LV+1WC	0.70	0.50	1.20	0.20
1.3	1LV+1WC	1.40	0.50	1.90	0.21
1.4	2LV+1WC	2.10	0.50	2.60	0.25
1.5	2LV+1WC+1SV	2.10	0.50	2.60	0.25
1.6	2LV+1WC+2SV	2.80	0.50	3.30	0.29
1.16	4LV+4WC+5SV	6.30	4.00	10.30	**0.52**

2.8.1.8 HN 1 Tânganu

❖ ***Water supply connection***

In order to ensure the necessary water flows for water supply, the project provides a connection to the public network in Bălăceanca village.

The indicative volume of water required and specific average flow rates will be adopted in accordance with SR 1343-1-2006, Normative I 9 - 2022 and NP133/2022:

- Average daily flow rate: Qday aver = 12.07m^3/day = 0.50 m^3/day = 0.13 l/s
- Maximum daily flow rate: Qday max = 15.69m^3/day = 0.65 m^3/h = 0.18 l/s
- Maximum hourly flow rate: Qho max = 1.88 m^3/h = 0.52 l/s

❖ ***Household domestic water storage tank***

Water will be pumped by: a water pumping unit with 2 pumps (1 active and 1 standby pump) fully equipped. (closing and regulating fittings, protection against lack of water, electrical command and control switchboard, etc.), with the following characteristics: Q = 20 mc/h, H = 58 mCA.

Pumping stations will be equipped as follows:

- base pump with Q=12mc/h H=7mCA;
- axial fan with Q=200m3/h; H=8mmCA;
- booster pump container 1000 l;
- water treatment plant.

❖ ***Water networks***

Water flow through the distribution network will be ensured by pumping. The diameter of the distribution pipe will be minimum D32 [mm] and maximum D110 [mm] PN10 with an approximate length of L=1100m. The water network will supply the operational block section.

❖ ***Internal plumbing in the operational block section building***

The building is equipped with sanitary facilities equipped with hot and cold water supply. Cold water will be supplied to the sanitary facilities from the water network designed in the premises of HN1 of Tânganu. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building.

Domestic wastewater from the sanitary facilities will be discharged through D=200mm connections to the external domestic sewerage network.

Meteoric waters from the roof of the building will be collected by DN100 mm terrace collectors, channelled and discharged to the external storm sewerage network through DN200 mm pipes.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

For sizing, the maximum hourly flow rate from water use per type of consumption (sanitary objects in the operational block building) is considered:

- Average daily flow rate used: Qus aver = 12.07 m^3/day = 0.50 m^3/day = 0.13 l/s
- Maximum daily flow rate used: Qus max = 15.69m^3/day = 0.65 m^3/h = 0.18 l/s
- Maximum hourly flow rate used: Qus ho max = 1.88 m^3/h = 0.52 l/s

In the area of the operational block building there is a DN 200 gravity domestic sewerage network, which collects the domestic wastewater from the building and transports it to the mechanical-biological treatment plant with a capacity of 15 m^3/day.

The length of the sewerage network in the multifunctional building area will be 300 m.

The mechanical-biological treatment plant has a capacity of 15 m3/day and consists of:

- pumping hygiene manhole equipped with two submersible sewage pumps with Q=9m3/h, H=5 mCA
- treatment module Q= 15 m3/day
- inspection manhole.

The treated water will be discharged by gravity into the Dâmbovița River through the outfall.

Water discharged into the emissary will fulfil the quality conditions of NTPA 001/2002 norms.

❖ ***Petroleum products (hydrocarbons) separator and meteoric sewerage networks***

Gravity rainwater drainage networks with a DN of 300-400 mm, with a total length of 450 m, have been provided. These networks collect rainwater from the roofs of the buildings and the concrete platforms (car parks) in their proximity. Rainwater will be discharged gravitationally into the Dâmbovița River through the outfall.

Prior to discharge into the emissary, rainwater from the car parking decks will be passed through petroleum product separators.

The treated water will be discharged into the Dâmbovița river, fulfilling the discharge conditions of the NTPA 001/2002.

❖ *Sizing elements*

Cold Water Network Sizing Calculation					
No	**Nr. of objects**	**0,7E1**	**E2**	**E**	**q_c**
					[l/s]
1.1	1WC		0.5	0.5	0.20
1.2	1LV+1WC	0.70	0.50	1.20	0.20
1.3	1LV+1WC	1.40	0.50	1.90	0.21
1.4	2LV+1WC	2.10	0.50	2.60	0.25
1.5	2LV+1WC+1SV	2.10	0.50	2.60	0.25
1.6	2LV+1WC+2SV	2.80	0.50	3.30	0.29
1.16	4LV+4WC+5SV	6.30	4.00	10.30	**0.52**

2.8.1.9 HN 2 of Cucuieți

❖ ***Water supply connection***

In order to ensure the necessary water flows for water supply, the project provides a connection to the public network in Podu Pitarului village.

The indicative volume of water required and specific average flow rates will be adopted in accordance with SR 1343-1-2006, Normative I 9 - 2022 and NP133/2022:

- Average daily flow rate: Qday aver = 12.07m^3/day = 0.50 m^3/day = 0.13 l/s
- Maximum daily flow rate: Qday max = 15.69m^3/day = 0.65 m^3/h = 0.18 l/s
- Maximum hourly flow rate: Qho max = 1.88 m^3/h = 0.52 l/s.

❖ ***Household domestic water storage tank***

Water will be pumped by: a water pumping unit with 2 pumps (1 active and 1 standby pump) fully equipped. (closing and regulating fittings, protection against lack of water, electrical command and control switchboard, etc.), with the following characteristics: Q = 20 mc/h, H = 58 mCA.

Pumping stations will be equipped as follows:

- base pump with Q=12mc/h H=7mCA;
- axial fan with Q=200m3/h; H=8mmCA;
- booster pump container 1000 l;
- water treatment plant.

❖ ***Water networks***

Water flow through the distribution network will be ensured by pumping. The diameter of the distribution pipe will be minimum D32 [mm] and maximum D110 [mm] PN10 with an approximate length of L=1500m. The water network will supply the operational block section.

❖ ***Internal plumbing in the operational block section building***

The building is equipped with sanitary facilities equipped with hot and cold water supply. Cold water will be supplied to the sanitary facilities from the water network designed in the premises of HN2 of Cucuieți. Hot water for the sanitary facilities will be supplied by the central heating plant provided in the building.

Domestic wastewater from the sanitary facilities will be discharged through D=200mm connections to the external domestic sewerage network.

Meteoric waters from the roof of the building will be collected by DN100 mm terrace collectors,

channelled and discharged to the external storm sewerage network through DN200 mm pipes.

❖ ***Wastewater treatment plants + Domestic sewerage networks***

For sizing, the maximum hourly flow rate from water use per type of consumption (sanitary objects in the operational block building) is considered:

- Average daily flow rate used: Qus aver = 12.07 m^3/day = 0.50 m^3/day = 0.13 l/s
- Maximum daily flow rate used: Qus max = 15.69m^3/day = 0.65 m^3/h = 0.18 l/s
- Maximum hourly flow rate used: Qus ho max = 1.88 m^3/h = 0.52 l/s

In the area of the operational block building there is a DN 200 gravity domestic sewerage network, which collects the domestic wastewater from the building and transports it to the mechanical-biological treatment plant with a capacity of 15 m^3/day.

The length of the sewerage network in the multifunctional building area will be 300 m.

The mechanical-biological treatment plant has a capacity of 15 m3/day and consists of:

- pumping hygiene manhole equipped with two submersible sewage pumps with Q=9m3/h, H=5 mCA
- treatment module Q= 15 m^3/day
- inspection manhole.

The treated water will be discharged by gravity into the Dâmbovița River through the outfall.

Water discharged into the emissary will fulfil the quality conditions of NTPA 001/2002 norms.

❖ ***Petroleum products (hydrocarbons) separator and meteoric sewerage networks***

Gravity rainwater drainage networks with a DN of 300-400 mm, with a total length of 450 m, have been provided. These networks collect rainwater from the roofs of the buildings and the concrete platforms (car parks) in their proximity. Rainwater will be discharged gravitationally into the Dâmbovița River through the outfall.

Prior to discharge into the emissary, rainwater from the car parking decks will be passed through petroleum product separators.

The treated water will be discharged into the Dâmbovița river, fulfilling the discharge conditions of the NTPA 001/2002.

❖ *Sizing elements*

Cold Water Network Sizing Calculation					
No	**Nr. of objects**	**0,7E1**	**E2**	**E**	**q_c**
					[l/s]
1.1	1WC		0.5	0.5	0.20
1.2	1LV+1WC	0.70	0.50	1.20	0.20
1.3	1LV+1WC	1.40	0.50	1.90	0.21
1.4	2LV+1WC	2.10	0.50	2.60	0.25
1.5	2LV+1WC+1SV	2.10	0.50	2.60	0.25
1.6	2LV+1WC+2SV	2.80	0.50	3.30	0.29
1.16	4LV+4WC+5SV	6.30	4.00	10.30	**0.52**

2.8.2. Heat supply

During the period of execution of the works, the heat supply in the work execution premises/site organisations will be provided by installing unit heaters or electric heating installations.

2.8.3. Power supply

Power supply will be ensured by connecting the existing electrical networks in the area of the sites.

2.9 Estimating the types and quantities of emissions and waste

2.9.1. Estimating the types and quantities of waste

The waste produced as a result of the execution of the planned works is estimated in two stages, as follows:

- during the execution period;
- during the operation period.

2.9.1.1 Types and quantities of generated waste

2.9.1.1.1 Types and quantities of waste generated during the execution period

The Governmental Decision No. 856/2002 *on waste management records and for the approval of the waste list, including hazardous waste,* establishes the obligation for economic operators and any other waste generators, natural or legal persons, to keep waste management records.

The following categories of waste are generated during the construction period:

- excavated earth and excavated materials (stone, crushed rocks, concrete); category 17;
  - code 17 01 01 concrete;
  - code 17 01 04 excavated earth and excavated material;
- mixed construction waste; category 17,
  - code 17 01 01 concrete
  - code 17 03 02 asphalt other than those mentioned in 17 03 01
  - code 17 02 01 - 17 02 03: wood, glass, plastic;
  - code 17 04 07 metals (including their alloys), mixed metals;
  - code 17 05 04 soil and stones
- recyclable waste: categories 15 and 20,
  - code 15 01 01 paper/cardboard packaging;
  - code 15 01 02 plastic packaging;
  - code 15 01 03 wooden packaging;
  - code 15 01 07 glass packaging;
  - code 20 01 01 paper and cardboard;
  - code 20 01 39 plastic;
  - code 20 01 38 wood;
- other types of waste
  - code 08 01 11* waste paint and varnish containing organic solvents or other dangerous substances
  - code 15 02 02* absorbents, filter materials (including oil filters without other specification), wiping cloths, protective clothing contaminated by dangerous substances
  - code 15 01 10* packaging containing residues of or contaminated by dangerous substances
- mixed municipal waste (household waste): category 20, code 20 03 01.

The amount of waste produced by one person per month during the execution will be:

0.50 kg/day x 22 days = 11 kg/month

In order to ensure an adequate level of protection for humans and the environment, technical overhauls of the machinery/means of transport used during the construction period (oil changes, replacement of oil filters, brake fluid, antifreeze, replacement of worn batteries, worn tyres) will be

carried out in authorised specialised service workshops.

The waste generated during the execution period of the planned construction works is waste that can be recovered (wood waste, metal waste), mixed municipal waste will be disposed of by authorised sanitation operators.

According to Government Decision No. 856/2002, the constructor is obliged to keep records of the production, temporary storage, treatment and transport of waste for recycling or permanent disposal.

The Contractor will keep strict records of the calendar dates, the quantities disposed of and the identification data of the means of transport used for the transport of the waste. These data will be summarised and presented in the annual monitoring report to be submitted to the Environmental Protection Agency.

Waste will be collected separately and recyclable waste will be recovered by a specialised firm. Most of the waste produced during the construction works will be reused for earthworks (excavated earth).

Estimates of the quantities of waste that may be produced during the construction of the bridge over the Prut River have been made taking into account the complexity of the works.

The table below shows the estimated quantities of waste generated during the works.

2.9.1.1.2 Types and quantities of waste generated during the operational period

No inert and non-hazardous waste arises during the period of operation of the planned works. There will be an exception during periods when intervention/repair works are being carried out, when the types of waste generated will be similar to those from the period of execution of the works.

The specific nature of the planned works does not entail the generation of toxic and hazardous waste during operation.

Ship-generated waste is managed in accordance with the legislation in force *(Ordinance No 9 /2022 on port reception facilities for ship-generated waste*). The aim of this ordinance is to reduce the discharge of ship-generated waste and cargo residues into national navigable waters, in particular illegal discharges from ships using Romanian ports, by improving the availability and use of port facilities for the reception of ship-generated waste and cargo residue, in order to improve the protection of the aquatic environment. Ship-generated waste consists of all types of waste, including sewage and residues other than cargo residues, which are generated during the operation of ships and fall under the provisions of Annexes I, IV and V of MARPOL 73/78, and cargo residues as defined in the International Maritime Organisation (IMO) guidelines for the implementation of Annex V of MARPOL 73/78. Cargo residues are the residues of cargo in stores or cargo tanks, which remain at the end of unloading and cleaning operations, including surpluses or spillages of cargo that may occur during loading/unloading operations. The captain of a ship calling at one of the Romanian ports to hand over all waste generated by the ship to a port reception facility.

Bilge waste is collected in accordance with the regulations in force via depollution vessels (so-called anti-pollution vessels).

2.9.1.1 Waste management

The following waste-generating works will need to be carried out in order to achieve the river control works:

- clearing bushes and shrubs
- topsoil removal
- digging and excavations;
- removal of worn road system - old asphalt
- demolition of technically unsuitable works.

In order to ensure an adequate level of protection for humans and the environment, technical

overhauls of the machinery/means of transport used during the construction period (oil changes, replacement of oil filters, brake fluid, antifreeze, replacement of worn batteries, worn tyres) will be carried out in authorised specialised service workshops.

The waste generated during the execution of the planned construction works is waste that can be recovered (wood waste, metal waste), inert waste (earth and stones from topsoil removal that can be recovered for backfilling); mixed municipal waste will be disposed of by authorised sanitation contractors.

During the period of operation, the waste generated will be collected by the ACN Administrator by operators authorised for the types of waste generated and transported for disposal/recovery depending on the type of waste, from the area of all the points where there are personnel carrying out their activities.

The waste generated will be disposed of on impervious (concrete) platforms, in bins designated for each type of waste, labelled with the code of the waste stored therein, sized appropriately for the quantities of waste that may be generated to prevent their improper disposal outside the bins. A monthly record will be kept of the quantities/types of waste generated, handed over for disposal/recovery and will be reported either at the request of the environmental authorities, or at the deadline set by the regulatory acts or annually (as mentioned in GEO 92/2021 on waste regime).

The waste generated during the execution period of the planned construction works is waste that can be recovered (wood waste, metal waste), mixed municipal waste will be disposed of by authorised sanitation operators.

According to Government Decision No. 856/2002, the constructor is obliged to keep records of the production, temporary storage, treatment and transport of waste for recycling or permanent disposal.

The Contractor will keep strict records of the calendar dates, the quantities disposed of and the identification data of the means of transport used for the transport of the waste. These data will be summarised and presented in the annual monitoring report to be submitted to the Environmental Protection Agency.

Waste will be collected separately and recyclable waste will be recovered by a specialised firm. Most of the waste produced during the construction works will be reused for earthworks (excavated earth).

Estimates of the quantities of waste that may be produced during the construction have been made taking into account the complexity of the works.

Table 10 shows the estimated amounts of waste generated during the construction period and Table 11 during the operational period.

Table no. 10 - Waste management during the period of execution of the works

Waste code	Type of waste	Physical condition[3]	Estimated quantity	Waste generator	Means of collection/disposal	Observations	Persons in charge
08 01 11*	waste paint and varnish containing organic solvents or other dangerous substances	S	0.07 t/year	Generated from painting works	This waste will be collected separately in suitable containers and stored temporarily in specially arranged premises and will be picked up and transported by authorised operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
15 01 01	paper and cardboard packaging	S	0.5 t/year	generated from packaging of used products/materials, from administrative activities carried out	collected in bins/areas designated for each type of waste, to be further collected and transported by operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
15 01 02	plastic packaging	S	0.5 t/year			Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
15 01 07	glass packaging	S	0.15 t/year			Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
15 01 03	wooden packaging	S	0.5 t/year			Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer

[3] S - solid, L - liquid, SS - semi-solid

Waste code	Type of waste	Physical condition[3]	Estimated quantity	Waste generator	Means of collection/disposal	Observations	Persons in charge
20 01 01	waste paper / cardboard	S	0.15 t/year			Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
15 01 10*	packaging containing residues of or contaminated by dangerous substances	S	0.5 t/year		the waste is deposited in bins designed for this type of waste, separated from other types of packaging waste, to be further collected and transported by operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
15 02 02*	absorbents, filter materials, wiping cloths, protective clothing contaminated with dangerous substances	S	0.3 t/year	generated from works on site	This waste will be collected separately in suitable containers and stored temporarily in specially arranged premises and will be picked up and transported by authorised operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
17 01 01	concrete	S	50 m3/months	waste concrete or asphalt mixes	In case of failure to respect the programme of works or materials qualitatively inadequate.	Generation of waste from rejected loads can be partially disposed of by ensuring correct working and operating schedules	Contractor, by means of the environmental officer
17 03 02	asphalt other than those mentioned in 17 03 01	S	3 m3/month				
17 01 04	earth and excavated materials;	S	3 m3/month	waste concrete or asphalt mixes	In case of failure to respect the programme of works or materials qualitatively inadequate.	Generation of waste from rejected loads can be partially disposed of by ensuring correct working and	Contractor, by means of the environmental officer

Waste code	Type of waste	Physical condition[3]	Estimated quantity	Waste generator	Means of collection/disposal	Observations	Persons in charge
						operating schedules	
17 02 03	plastics	S	3 m3/month	generated from works on site	This waste will be collected separately in suitable containers and stored temporarily in specially arranged premises and will be picked up and transported by authorised operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
17 03 02	asphalt other than those mentioned in 17 03 01	S	3 m3/month	generated from works on site	This waste will be collected separately in suitable containers and stored temporarily in specially arranged premises and will be picked up and transported by authorised operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
17 02 01	wood	S	1 t/year	routine maintenance and site activities	They will be selected and reused according to size as accessories and supporting elements in construction works	The project provides the recovery of this waste in its entirety	Contractor, by means of the environmental officer
17 04 07	mixed metals	S	2 t/year	routine maintenance and site activities	They will be selected and collected by authorised operators for recovery.	The project provides the recovery of this waste in its entirety	Contractor, by means of the environmental officer
17 05 04	soil and stones	S	80 m3/months	day-to-day site activities and demolition work	This waste will be taken back by operators for recovery	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
20 01 39	plastics	s	0.3 t/year	day-to-day site activities and demolition work	This waste will be taken back by operators for recovery	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer
20 01 38	wood	s	0.5 t/year	day-to-day site activities and demolition work	This waste will be taken back by operators for recovery	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer

Waste code	Type of waste	Physical condition[3]	Estimated quantity	Waste generator	Means of collection/disposal	Observations	Persons in charge
20 03 01	mixed municipal waste	S	3 t/year	activities carried out on work premises	Collection in bins, disposal at waste disposal sites by specialised companies on a contract basis.	Waste management records are kept according to the legislation in force.	Contractor, by means of the environmental officer

Table no. 11 - Waste management during the period of operation

Waste code	Type of waste	Physical condition[4]	Estimated quantity	Waste generator	Means of collection/disposal	Observations	Persons in charge
08 01 11*	waste paint and varnish containing organic solvents or other dangerous substances	S	0.02 t/year	Generated from repair/maintenance works	This waste will be collected separately in suitable containers and stored temporarily in specially arranged premises and will be picked up and transported by authorised operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Holder, by means of the environmental officer
15 02 02*	absorbents, filter materials (including oil filters without other specification), wiping cloths, protective clothing contaminated by dangerous substances	S	0.02 t/year	generated from repair/maintenance works during the operational period	This waste will be collected separately in suitable containers and stored temporarily in specially arranged premises and will be picked up and transported by authorised operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Holder, by means of the environmental officer
15 01 10*	packaging containing residues of or contaminated by dangerous substances	S	0.02 t/year	generated from repair/maintenance works during the operational period	This waste will be collected separately in suitable containers and stored temporarily in specially arranged premises and will be picked up and transported by authorised operators to regulated disposal facilities.	Waste management records are kept according to the legislation in force.	Holder, by means of the environmental officer

[4] S - solid, L - liquid, SS - semi-solid

In the area of ports where there will also be ship traffic, waste management will be the responsibility of the port managers and is not the subject of this report.

2.9.1.1 Waste prevention and reduction programme

In order to ensure proper management, to prevent mixing and/or contamination of recyclable waste, the following rules will be observed:

- waste is handed over to environmentally authorised collectors for collection and/or disposal/recycling.
- the waste resulting from the activity is collected separately by waste type;
- the waste will be disposed of in plastic/metal bins, appropriately labelled, without harming the environment;
- the number of bins and their capacity will be adapted according to the amount of waste generated; they will be placed in a concrete, covered area accessible to all employees;
- this will encourage selective collection;
- different categories of waste must not be mixed, employees must sort the waste before depositing it in bins;
- in the case of packaging containing liquids/food, these should be emptied/washed before being placed in the bins (e.g. soda bottles must be emptied before throwing them in the plastic bin; polystyrene containers with ordered food must be emptied and washed before throwing them in the bin, etc.);
- hazardous waste will be deposited in appropriate containers provided by the collectors on the basis of a co-operation contract;
- Waste is only handed over to companies that are environmentally authorised to collect this waste;
- significant waste stockpiles will be avoided by periodic disposal of waste according to the needs of each individual place.

The period of temporary storage must not exceed 1 year in the case of hazardous waste to be disposed of and 3 years if the waste is to be handed over to a collector for recycling or recovery.

In accordance with the legislative provisions in force on waste management, the company will draw up the management records on a monthly basis, based on the forms established by GD 856/2002, and will report the data annually to the county Environmental Protection Agency. These records and reports will be prepared for each individual establishment, and the responsibility for their preparation is determined by the company management.

Waste management records will be kept for each individual waste code on the basis of the transport annexes drawn up at the time of handover either by the collector or by the company or, in the absence of such documents, on the basis of estimates.

In order to reduce the amount of waste generated annually, where possible, some measures are proposed to reduce the amount of waste generated, as follows:

❖ ***Efficient management of paper and cardboard waste:***

- avoiding waste and reducing paper use:
  - printing only if absolutely necessary:
  - printing on both sides
  - shrunk fonts, resulting in fewer printed pages
- installing and using separate collection containers
- informing employees about the types of paper/cardboard that can be recycled
- handing over paper and cardboard waste to authorised recycling operators.
- identifying and using durable, damage-resistant paper and cardboard packaging.

❖ ***Efficient household waste management:***

- organising separate waste collection

- ***Efficient management of packaging waste containing residues of or contaminated by dangerous substances:***

- storing products only in their original packaging;
- organising separate waste collection

- ***Efficient management of wastes absorbents, filter materials, wiping cloths, protective clothing other than those mentioned in 15 02 02:***

- immediate identification of accidental spills,
- rapid remedial action.

2.9.1.2 Waste management plan

Waste management must be carried out without harming human health and the environment, and must not give rise to risks to air, water, soil, subsoil, fauna and flora.

The prevention or reduction of the amount of waste generated as a result of the execution phase will be possible through: reuse/recovery of waste (metal, excavated earth or other waste that can be reused) through recycling, recovery or any other process that produces secondary raw materials.

The disposal of waste resulting from the use of chemicals will be carried out by environmentally authorised companies.

The waste management plan involves the collection/storage/disposal of both solid and liquid hazardous and non-hazardous waste. To this end, the waste generated during construction periods is managed as follows:

- textile waste (cloths) is collected in sealed containers and taken over based on a contract with an authorised firm.
- household waste is pre-collected in containers (bins) located in the site organisation area. The disposal and storage of household waste is carried out by an authorised company;
- packaging waste of hazardous chemicals will be collected in big bags and recovered based on contracts with authorised companies.
- waste oil will be collected in metal drums and recovered by authorised companies.

Employees will be trained on how to handle the waste and how to sort it by category in the bins provided for each waste category. The waste generated will be handed over as it is generated in order to avoid the creation of stocks that could harm the environment.

The Contractor will draw up and keep records of the quantities recovered in accordance with the provisions of GD 856/2002 and GEO No 92/2021 on the waste regime, as subsequently amended and supplemented.

The Contractor will ensure that it complies with the requirements of the National Waste Management Plan and the National Waste Prevention Plan.

The "*waste hierarchy*" principle, which classifies the different waste management options, will be put into practice and priority will be given to waste prevention, waste minimisation, waste re-use, recycling, energy recovery and, last but not least, disposal by incineration or landfill.

2.9.2. Air emissions

During the execution of the River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses, the air may be polluted as a result of the activities carried out both within the site organisation and especially in the work zones and on the access roads to and from the work zone.

Air pollution occurs in particular during topsoil removal, excavation, backfilling as a result of earth handling and traffic for the transport of earth and ballast.

The level of pollution caused by these operations depends on the technology used and the efficiency of the machines used.

Air pollution will be punctually manifested within the work zone and access roads, the pollution sources can be characterised by:

- ground sources with effective emission heights up to 4 m above ground level
- open sources involving the handling of soil and/or spent material with high suspended solids content
- mobile sources represented by construction machinery, means of transport used to implement the project.

In terms of site organisation, the main sources of emissions can be material stockpiles, which can generate high concentrations of emissions during periods of higher wind intensity and for which periodic wetting or covering with tarpaulins (if the surfaces allow it) is recommended. Another source of air pollution is exhaust fumes from vehicles entering / leaving the premises of the site organisation.

Car traffic is a source of air pollution during the works and will be further analysed.

Air pollution from car traffic is caused by the burning of fuels in engines and frictional wear of materials at different contact surfaces. This type of pollution occurs as a result of:

- the emission of combustion products from vehicle engines into the atmosphere
- the generation of various types of dust from wear and tear on the road and tyres, brakes and clutches.

The pollutants resulting from the combustion of the fuel mixture are: CO_2, CO, nitrogen oxides (NO_x), burned and unburned hydrocarbons (HC), sulphur oxides, especially SO_2. Depending on the type of fuel used, the exhaust gases may also contain Pb and smoke particles.

The concentrations of these compounds depend on a number of factors such as:

- type of fuel used (petrol, diesel)
- travelling speed, driving conditions (number of accelerations, braking, idling)
- road traffic intensity
- driving on ramps or straight roads.

Activities in the area of the work zone(s) that may generate emissions of air pollutants are:

- movement of vehicles
- operation of machinery needed for digging, loading/unloading materials, material handling, etc.
- material loading/unloading, digging.

Machinery used to carry out the works will travel only on the access roads from the project site and within the work zones and will have a maximum radius of 20 metres. It is strictly forbidden to move machinery outside of the existing working roads so that only the areas specified in the project are affected.

Emissions of air pollutants will be generated by lorries used for the transport of construction materials (transport of ballast, cement asphalt and asphalt mixes, etc.). There will also be emissions from vehicles used to transport workers and equipment. These emissions will occur linearly (along access roads to the project site) and will not be significant.

Transport is another source of air pollution during construction works.

The level of emissions varies depending on the technology and equipment used during these activities.

Forecasting the impact during the execution period

The atmosphere is considered to be the most widespread vector for the propagation of pollution, with the discharged noxious emissions directly and indirectly affecting, both near and far, the human element and all other components of the natural and man-made (built) environment.

Emissions from fuel combustion include common pollutants (NOx, SO_2, CO, particulate matter), potentially carcinogenic substances (cadmium, nickel, chromium and polycyclic aromatic hydrocarbons), nitrous oxide (N_2O) - the substance blamed for depleting the stratospheric ozone layer, methane - which together with CO_2 have global environmental effects as greenhouse gases.

Dust emissions often vary substantially from one day to the next, depending on the level of activity, the specifics of the operations and weather conditions.

Pollutant emissions decrease as engine performance improves. The current global trend is towards manufacturing engines with the lowest possible fuel consumption per unit of power and the most restrictive emission controls.

For means of transport, categorised as heavy duty vehicles according to the CORINAIR methodology, the correlations between pollutant emissions and engine technology, fuel consumption per unit of power or per 100 km, vehicle age, driving speed, etc. are also valid.

16-tonne dumpers manufactured in Romania have a high fuel consumption of 40 - 45 l/100 km, while the CORINAIR methodology estimates an average fuel consumption of 29.9 l/100 km for diesel heavy duty vehicles. Actual fuel consumption of very heavy vehicles carrying 40-45 tonnes does not exceed 50-55 l/100 km. The specific consumption per 1 tonne of material transported is about 2 times lower than the consumption of 16 t tippers.

For the construction of the objective it is assumed that heavy vehicles with average characteristics will be used: capacity 30 t and fuel consumption 40 l/100 km. Taking into account the above-mentioned aspects, air pollutant emission values have been estimated for the period of execution of the works covered by this study.

Mass flow rates and concentrations of air pollutants

All types of machinery run on diesel engines, and the exhaust gases released into the atmosphere contain the entire range of pollutants specific to internal combustion of diesel fuel: nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOC), methane (CH4), carbon oxides (CO, CO2), ammonia (NH3), heavy metal particles (Cd, Cu, Cr, Ni, Se, Zn), polycyclic aromatic hydrocarbons (PAH), sulphur dioxide (SO2).

The complex of organic and inorganic pollutants emitted into the atmosphere with exhaust gases contains substances of varying degrees of toxicity. In addition to the common pollutants (NOx, SO_2, CO, particulate matter), there are also substances with carcinogenic potential, as revealed by epidemiological studies carried out under the aegis of the WHO (World Health Organisation), namely cadmium, nickel, chromium and polycyclic aromatic hydrocarbons (PAHs).

The main area of emission of pollutants resulting from the activity of machinery and means of transport is considered to be the area of the work zone.

Maximum pollutant concentrations are generated within this area. Dispersion studies (from the literature) supplemented by measurements show that outside traffic areas, concentrations of air pollutants are substantially reduced. Thus, at 20 m outside the transport corridor, concentrations are reduced by 50% and at more than 50 m the reduction is 75%.

Within the site and along the transport corridor, the distribution of pollutants will be considered uniform. Means of transport are assimilated to linear sources of pollution. The machines, on the other hand, travel short distances in the area of the work zones.

Estimates of fuel consumption during execution were made on the basis of work volumes. According to these data, daily fuel consumption during the most active periods resulted as follows:

- for means of transport - 198 litres

- for machinery - 179 litres
    - total - 377 litres.

Based on these assumptions and the US EPA/AP - 42 methodology, the emissions of pollutants into the atmosphere during the execution of the works are estimated to be as follows (tables 12-13):

Table no. 12 - Pollutant flows from the combustion of fuels

Nature of the pollutant	Emissions (g/kg)	Daily emissions (g/day)	Hourly emissions (g/h)
NOx	0.64	8.05	0.80
CO	0.26	3.22	0.32
VOC	0.10	1.29	0.13
particulate matter	0.05	0.64	0.06
SO_2	0.13	1.61	1.61
CH_4	0.003	0.039	0.004
N_2O	0.002	0.019	0.002

Table no. 13 - Pollutant flows from vehicle traffic

Nature of the pollutant	Emissions (g/kg)	Daily emissions (g/day)	Hourly emissions (g/h)
NOx	0.60	8.39	0.84
CO	0.52	7.22	0.72
VOC	0.12	1.61	0.16
particulate matter	0.06	0.79	0.08
SO_2	0.14	1.98	0.20
CH_4	0.003	0.048	0.005
N_2O	0.002	0.024	0.010

According to the US -EPA - AP - 42 assessments, emissions of particulate matter (including PM10) from machinery on construction sites can be estimated at 2.69 tonnes/ha/month.

Concentration values of 1.0 - 1.2 mg/m^3 can be achieved. Airborne particulate matter from machinery is added to particulate matter from means of transport on sectors where both activities are carried out.

The above assessments of the concentrations of airborne particulate matter (dust) correspond to the most unfavourable meteorological and technological situations. By monitoring construction works and applying concrete measures (such as sprinkling of dirt roads, stopping work during periods of strong winds), construction works will be within legal limits in terms of particulate matter concentration in the air

It should be noted that the choice of machinery, site organisation, execution technology, work flow, all fall within the responsibilities of the appointed contractor, but will be selected in such a way as to minimise air pollutant emissions.

2.9.3. Emissions of pollutants in the aquatic environment

As hydro-engineering works and port developments are works carried out on the water or at the edge of the bank/shoreline, the analysis of the impact of these works on surface waters is particularly important.

In the assessment of impacts on surface water the following were analysed:

- characteristics of these resources at risk (seasonal and annual flow, etc.), precipitation regime, storage possibilities, etc.;
- current use of water resources: domestic, commercial, industrial, agricultural or recreational;

- the existence of discharges of water and spills which could be significant for water quality, remedial measures already taken or planned;
- effects on fish, wildlife;
- possible effects of the project on water flow, depth and width of river banks, bank erosion, sedimentation rate (upstream and downstream) and turbulence;
- a history of pollution or misuse of water resources that has affected human health or been harmful to animals, aquatic life, birds or fish.

The main works and activities that can influence morphological conditions and the quality of water resources are the following:

- dredging, filling and storage of dredged material;
- construction of quays, dykes, ports and other similar structures;
- existence of pilings, caissons and other structures;
- loading/unloading operations of materials that may produce wind-driven dust;
- loading/unloading of petroleum products or other highly polluting liquid substances;
- discharge of waste water from ships, port activities, including storm water, into the port basin;
- ship repair operations;
- solid waste disposal;
- navigation activities.

2.9.4. Soil and subsoil contamination

Powders resulting from the processes of excavation, loading, transport and unloading of earth can only be considered as pollutants to the extent that they are associated with other pollutants (e.g. SO_2 with dust particles).

During the execution period there are a number of changes in the quality and structure of the soil due to the occupation of some areas by the site organisation, borrow pits. Forms of impact identified during this period can be:

- topsoil removal and creating an artificial profile in the area where borrow material is taken;
- the occurrence of soil erosion
- concreting of certain areas of the work reserve area or site organisation
- loss of the natural characteristics of fertile soil through improper storage in soil pits resulting from topsoil removal
- accidental pollution by hydrocarbons or other substances, as well as by faecal and domestic waste water
- uncontrolled dumping of waste, construction materials, technological waste.

The main soil pollutants originating from construction activities specific to site organisation are:

- petroleum products that may end up in the ground as a result of accidental spills due to technical failures;
- spills from products stored within the site organisation and/or work zones which may end up on the ground or adjacent land
- construction material dust and waste from material transport processes, etc.;
- NOx emissions (NO_x, SO_2, dust) from car traffic
- intermediate (bulk) stockpiles of construction materials (especially powdery materials) that may be washed away by stormwater, with the particles being washed onto adjacent land.

During the operation/use period, pollutants from road traffic (in the area of the roads adjacent to the fairway) generally have a low impact on soil. Most of the time, the concentration in soil of pollutants from road traffic (e.g. Pb, Ni, Zn) are within normal values or below the alert threshold for less sensitive soils. In addition to the direct impact of these pollutants on the environment, there is also a negligible indirect impact through bioaccumulation.

Other pollutants from road traffic are:

- residues in the unburned fuel;
- residues from tyre wear;
- metal residues from vehicle wear and corrosion;
- accidental losses of mineral oils and fats;
- residues from road wear
- accidental release of toxic substances or hydrocarbons following road accidents.

The platforms for maintenance and washing of machinery should be designed with a slope so as to ensure the collection of waste water (from washing machines), oils, fuels, and then their introduction into a decanter to be periodically cleaned and the deposits transported to the nearest treatment plant or landfill.

On completion of the works, the site organisation will be dismantled, the site will be cleaned up and the current site and access roads will be restored to their original state before the works started.

Another source of soil damage is the definitive land occupation by the implementation of this project.

On the basis of the data at our disposal (and which can be found in Annex 3 to this report), the total areas occupied by the project are:

- **15109550 sq. m** in Călărași county on the Argeș and Dâmbovița rivers
- **8675917 sq. m** in Giurgiu county on the Argeș river
- **3775278 sq. m** in Ilfov county on the Argeș river.

2.9.5. Noise and vibration

The construction phase will generate noise and vibration through the activities themselves (including the handling of the construction materials used) and through the transport of materials, which will overlap the existing background. The construction involves the use of heavy machinery, which, when travelling, causes noise and vibration. These machines are supplemented by lorries, which have a high mass even when unladen.

Both during the works execution period and during the operation period, the maximum permissible noise levels during the day and during the 22-6 time interval, values established by *Order 119/2014 validating Hygiene and Public Health Norms regarding the living environment of the population* as subsequently amended and supplemented, will be respected.

It is assessed that the acoustic environmental condition at the boundary of the site organisation / work zones will not exceed the limit of 65 dB(A) according to STAS 10009/2017.

2.9.5.1 Sources of noise

Potential sources of noise during the works are:

- earthworks and foundation work involving digging, operation of heavy machinery, loading/unloading of materials, waste, drilling, etc.
- concrete and asphalt mixing plants which are sources of noise generated by their operations
- road works involving milling, compaction, etc.

Below are the associated sound power levels of some construction machines:

- bulldozer - Lw = 115 dB(A)
- loaders - Lw = 112 dB(A)
- dumpers - Lw = 107 dB(A)

The literature shows that in the open field, when sound is not reflected by obstacles, the sound level decreases by 6 dB at a doubling of the distance of 10-20 metres from the source. Thus at 100 metres from the source the sound level halves to about an average maximum of 68 dB.

The sound levels obtained are:

- dumpers - LAeq = 43 dB(A)
- loaders - LAeq = 55 dB(A)
- bulldozer - LAeq = 66 dB(A).

Other sources of noise generated during the works are also motorised traffic - vehicles transporting materials and/or waste, personnel to and from the work zone.

During the operational period the noise sources are the activities in the port area, car and ship traffic either in the port area or on the access roads to and from the ports or on the side roads.

2.9.6. Sources of biological pollution

Biological pollution appears as a result of human activities. Unlike other forms of pollution, which can be reduced through various measures, laws and regulations, this is the most difficult to control. Once in the air, water or soil, biological pollutants grow and multiply rapidly unless urgent action is taken to stop them. Biological substances originate from living organisms and can affect human health, change the physico-chemical conditions of natural habitats and alter ecosystems.

Biological pollution disturbs the ecological balance through the unintentional or deliberate introduction of a foreign organism into the environment. It is therefore characterised by living organisms moving either accidentally or intentionally from the places where they have evolved to new environments where they can thrive in the absence of natural enemies. These organisms can threaten crops, forests and even human health. This type of pollution is widespread worldwide.

Biological pollutants can come from plants, animals, insects or other living organisms that move into new living environments, diminishing people's quality of life.

The growth and spread of these biological contaminants are dependent on nutrient sources, temperature, air movement and humidity.

Contaminants that cause biological pollution can be of two types:

- live pollutants - bacteria, viruses, fungi or mould spores.
- dead organics from animal carcasses, animal hair and saliva, gases from fermentation processes, unpleasant odours from toilets.

Contaminants are also invasive species that become established in ecosystems or natural habitats, threatening biological diversity.

Depending on the location of the contamination, there are several types of biological pollution:

- biological pollution of water;
- biological pollution of air, which can occur both indoors and outdoors;
- biological pollution of soil from household waste, animal husbandry, sewage,
- biological contamination of food.

Biological pollution of water occurs when various organisms (e.g. bacterial species and viruses), worms or algae are present in greater than normal numbers. This type of pollution is caused by the degradation of organic material in the water and can be caused by residues from food factories, animal waste, industrial discharges and improper disposal of human waste.

Biological pollution of water can be caused by various pathogens such as bacteria, viruses, protozoa and others. When their numbers start to grow, they can heavily contaminate water.

Biological pollution of soil is caused by contamination with different organisms such as bacteria, viruses and parasites. They can come from both humans and animals, and end up in the soil through various types of waste. One example is the continuous application of fertiliser from farmyards, where large amounts can seriously affect soil health. Soil pollution can lead to soil erosion, salinisation, loss of biodiversity, landslides or flooding.

Biological pollution of air refers to both outdoor and indoor air contamination. Biological contaminants include bacteria, moulds, viruses, dust mites and pollen, and there are several sources from which they come. Pollen comes from plants, viruses are transmitted by humans and animals, bacteria are carried by humans, animals and soil and plant debris. Household pets are sources of saliva and hair.

Biological pollution is also a major threat and can have negative effects at the level of an individual organism, population or ecosystem.

Biological pollution is considered more threatening than any other form of pollution because it is so difficult to control. An oil spill, which is a chemical pollution, eventually disperses, whereas biological agents are generally resilient, long-lived, aggressive and very flexible. They compete with native species for nutrition, pollination and survival, and can eventually capture the entire ecosystem.[5]

By the *Order of the Minister of Environment, Waters and Forests No. 3.008/2022 on the approval of the National Action Plan for addressing the priority pathways of introduction of invasive alien species in Romania, within the project "Appropriate management of invasive alien species in Romania, in accordance with Regulation (EU) No 1.143/2014 on the prevention and management of the introduction and spread of invasive alien species"*, the National Action Plan for addressing the prioritised pathways of introduction of invasive alien species in Romania, within the project "Appropriate management of invasive alien species in Romania, in accordance with Regulation (EU) No 1.143/2014 on the prevention and management of the introduction and spread of invasive alien species"[6]was approved.

The National Action Plan to address Priority Pathways (NAPAPP) represents the commitment of public authorities and the community to manage invasive alien species to ensure a suitable environment, better living conditions and sustainable development. The adoption of the NAPAPP is an obligation of Romania established by Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, by Article 13(2) ("... each Member State will establish and implement a single action plan or a set of action plans to address priority pathways..."). Beyond this obligation, the need for a preventative approach to biological invasions is recognised, especially in the context of the threat they pose to the conservation status of species and natural habitats, to the health of the population and to the efficiency of certain economic activities. The NAPAPP was developed in a participatory manner within the framework of the project Adequate Management of Invasive Alien Species in Romania, in accordance with Regulation (EU) No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species.

Taking into account the magnitude of negative environmental effects and the degree of invasiveness, the following categories of alien species have been categorised as having potentially major impact (Blackburn et al. 2011):

- C3 - Alien species escaped/introduced in the wild,
- reproduction occurring and population self-sustaining
- D1 - Self-sustaining population of the alien species in the wild, from which new individuals disperse and survive at a significant distance from the original point of introduction

[5] https://ecosynergy.ro/poluarea-biologica-ce-este-care-sunt-sursele-ei-si-cum-afecteaza-calitatea-apei-a-aerului-si-a-solului/

[6] OFFICIAL GAZETTE OF ROMANIA, PART I, No. 1172 bis/7.XII.2022

- D2 - Self-sustaining population of the alien species in the wild, with new individuals dispersing, surviving and reproducing a significant distance from the original point of introduction
- E - Fully invasive species, with individuals dispersing, surviving and reproducing at multiple sites across a greater or lesser spectrum of habitats.

The species considered to be highly invasive in Romania are presented in Table 14, together with the pathways of introduction into the EU and their spread in Romania (the list is not exhaustive and regular updates are recommended).

Table no. 14 - Plant and animal species with high invasive potential in Romania

Scientific name	Pathways of introduction	Estimated expansion in Romania
Callinectes sapidus	Secondary natural dispersion	Contained
Crassostrea virginica	Transport of the species as commodities - contamination	Contained
Eurypanopeus depressus	Association with a means/vector of transport	Contained
Magallana gigas	Transport of the species as commodities - contamination	Contained
Mya arenaria	Association with a means/vector of transport	Widespread
Palaemon macrodactylus	Association with a means/vector of transport	Abundant
Aedes albopictus	Transport of the species as commodities - contamination	Widespread
Corbicula fluminalis	Facilitating natural dispersal - establishing corridors	Contained
Corbicula fluminea	Facilitating natural dispersal - establishing corridors	Contained
Dreissena polymorpha	Secondary natural dispersion	Widespread
Dreissena rostriformis bugensis	Facilitating natural dispersal - establishing corridors	Contained
Orconectes limosus	Secondary natural dispersion	Contained
Physella acuta	Association with a means/vector of transport, Facilitating natural dispersal - establishing corridors	Contained
Pseudosuccinea columella	Association with a means/vector of transport	Contained
Argas (Argas) reflexus	Association with a means/vector of transport	Widespread
Arion vulgaris	Transport of the species as commodities - deliberate release	Contained
Corythucha arcuata	Secondary natural dispersion	Widespread
Hyalomma aegyptium	Association with a means/vector of transport	Contained
Monomorium pharaonis	NA	Widespread
Phyllonorycter issikii	Secondary natural dispersion	Local abundance
Riphicephalus rossicus	Association with a means/vector of transport	Contained
Varroa destructor	Association with a means/vector of transport	Widespread
Xylosandrus germanus	NA	Contained
Alopochen aegyptiacus	Transport of the species as commodities - deliberate release; Transport of the species as commodities - unintentional loss of specimens; Facilitation of natural dispersal - establishing of corridors	Contained
Ameiurus melas	Secondary natural dispersion	Local abundance
Ameiurus nebulosus	Transport of the species as commodities - deliberate	Local abundance

Scientific name	Pathways of introduction	Estimated expansion in Romania
	release; Facilitation of natural dispersal - establishing of corridors; Secondary natural dispersal	
Dama dama	Transport of the species as a commodity - intentional release; Transport of the species as a commodity - unintentional loss of individuals; Facilitation of natural dispersal - establishment of corridors; Secondary natural dispersal	Contained
Lepomis gibbosus	Transport of the species as commodities - deliberate release; Secondary natural dispersal	Local abundance
Myocastor coypus	Transport of the species as commodities - unintentional loss of individuals; Secondary natural dispersal	Contained
Neovison vison	Transport of the species as commodities - unintentional loss of individuals; Secondary natural dispersal	Contained
Nyctereutes procyonoides	Transport of the species as commodities - unintentional loss of individuals; Secondary natural dispersal	Contained
Oncorhynchus mykiss	Transport of the species as commodities - unintentional loss of specimens	Contained
Ondatra zibethicus	Transport of the species as commodities - unintentional loss of individuals; Secondary natural dispersal	Contained
Oryctolagus cuniculus	Transport of the species as commodities - deliberate release	Contained
Perccottus glenii	Facilitation of natural dispersal - establishing of corridors; Secondary natural dispersal	Widespread
Phasianus colchicus	Transport of the species as commodities - deliberate release; Secondary natural dispersal	Widespread
Pseudorașbora parva	Transport of the species as commodities - contamination; Secondary natural dispersal	High abundance
Rattus norvegicus	Association with a means/vector of transport; Secondary natural dispersion	Widespread
Rattus	Association with a means/vector of transport; Secondary natural dispersion	Widespread
Salvelinus fontinalis	Transport of the species as commodities - unintentional loss of specimens	Widespread
Threskiornis aethiopicus	Transport of the species as commodities - unintentional loss of specimens	Contained
Procyon lotor	Transport of the species as commodities - unintentional loss of individuals; Association with a means/ vector of transport	Contained
Acer negundo	Species intentionally introduced	Widespread
Ailanthus altissima	Species intentionally introduced	Widespread
Amaranthus retroflexus	Species accidentally introduced	Widespread
Ambrosia artemisiifolia	Species accidentally introduced	Widespread
Ambrosia trifida	Species accidentally introduced	Local abundance
Amorpha fruticosa	Species intentionally introduced	Local abundance
Asclepias syriaca	Species intentionally introduced	Local abundance
Azolla filiculoides [synonymous with	Species accidentally introduced	Local abundance

Scientific name	Pathways of introduction	Estimated expansion in Romania
Azolla caroliniana]		
Echinocystis lobata	Species intentionally introduced	Local abundance
Elaeagnus angustifolia	Species intentionally introduced	Local abundance
Elodea canadensis	Species accidentally introduced	Local abundance
Elodea nuttallii	Species accidentally introduced	Local abundance
Erigeron annuus subsp. *annuus*	Species accidentally introduced	Widespread
Erigeron canadensis	Species accidentally introduced	Widespread
Fraxinus pennsylvanica	Species intentionally introduced	Local abundance
Helianthus tuberosus	Species intentionally introduced	Local abundance
Humulus scandens	Species intentionally introduced	Local abundance
Impatiens parviflora	Species intentionally introduced	Local abundance
Impatiens glandulifera	Species intentionally introduced	Local abundance
Ludwigia peploides	Species accidentally introduced	Contained
Paspalum distichum	Species accidentally introduced	Local abundance
Phytolacca americana	Species intentionally introduced	Widespread
Reynoutria × *bohemica*	Species intentionally introduced	Local abundance
Reynoutria japonica	Species intentionally introduced	Local abundance
Rudbeckia laciniata	Species intentionally introduced	Local abundance
Sicyos angulatus	Species intentionally introduced	Local abundance
Solidago canadensis	Species intentionally introduced	Local abundance
Symphyotrichum lanceolatum	Species intentionally introduced	Local abundance
Xanthium orientale subsp. *italicum*	Species accidentally introduced	Widespread

The invasive alien species prioritised in Romania are those listed in Regulation (EU) No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species, which are presented in Table 15. The scientific name complies with Regulation (EU) No 1143/2014.

Table no. 15 - Prioritised invasive alien invasive species in Romania according to Regulation (EU) No 1143/2014

Scientific name	Common name	Pathways of introduction identified
Ailanthus altissima	Tree of Heaven	Forestry, horticulture
Asclepias syriaca	Common Milkweed	Horticulture, escaped from cultivation (beekeeping use)
Cabomba caroliniana	Carolina fanwort	Landscaping, deliberate release, aquaristics
Elodea nuttallii	Nuttall's waterweed	Secondary natural dispersal, aquaristic
Heracleum sosnowskyi	Sosnowsky's hogweed	Secondary natural dispersal, escaped from cultivation (experiments for use as forage)
Humulus japonicus (Humulus scandens)	Japanese Hop	Secondary natural dispersal, escaped from cultivation (ornamental species)

Scientific name	Common name	Pathways of introduction identified
Impatiens glandulifera	Himalayan balsam	Secondary natural dispersal, escaped from cultivation (ornamental species)
Ludwigia peploides	-	Secondary natural dispersal, escaped from cultivation (ornamental species)
Myriophyllum aquaticum	Parrotfeather	Secondary natural dispersal, aquaristic
Alopochen aegyptiacus	Egyptian goose	Transport of the species as commodities - deliberate release; Transport of the species as commodities - unintentional loss of specimens; Facilitation of natural dispersal - establishing of corridors
Ameiurus melas	Black bullhead	Secondary natural dispersion
Ameiurus nebulosus	Brown bullhead	Transport of the species as commodities - deliberate release; Facilitation of natural dispersal - establishing of corridors; Secondary natural dispersal
Eriocheir sinensis	Chinese mitten crab	Association with a means/vector of transport
Lepomis gibbosus	Pumpkinseed	Transport of the species as commodities - deliberate release; Secondary natural dispersal
Myocastor coypus	Nutria	Transport of the species as commodities - unintentional loss of individuals; Secondary natural dispersal
Nyctereutes procyonoides	Raccoon Dog	Transport of the species as commodities - unintentional loss of individuals; Secondary natural dispersal
Ondatra zibethicus	Muskrat	Transport of the species as commodities - unintentional loss of individuals; Secondary natural dispersal
Orconectes limosus	Spiny-cheek Crayfish	Secondary natural dispersion
Perccottus glenii	Amur sleeper	Facilitation of natural dispersal - establishing of corridors; Secondary natural dispersal
Procambarus fallax f. virginalis	Marbled crayfish	Transport of the species as commodities - deliberate release
Procyon lotor	Racoon	Transport of the species as commodities - unintentional loss of individuals; Association with a means/ vector of transport
Pseudorasbora parva	Stone Moroko	Transport of the species as commodities - contamination; Secondary natural dispersal
Threskiornis aethiopicus	Sacred Ibis	Unintentional transport of the species for consumption - loss
Trachemys scripta	Pond Slider -	Transport of the species as commodities - deliberate release; Transport of the species as a consumer good - unintentional loss of specimens

Although they have not yet been reported in Romania, special importance should be given to the following species, which are on the European Union's list of invasive species:

- **Plants**: *Acacia saligna (Acacia cyanophylla), Alternanthera philoxeroides, Andropogon virginicus, Baccharis halimifolia, Cardiospermum grandiflorum, Cortaderia jubata, Eichhornia crassipes, Ehrharta calycina, Gunnera tinctoria, Gymnocoronis spilanthoides, Heracleum mantegazzianum, Heracleum persicum, Hydrocotyle ranunculoides, Lagarosiphon major, Lespedeza cuneata (Lespedeza juncea* var. *sericea), Ludwigia grandiflora, Lygodium japonicum, Lysichiton americanus, Microstegium vimineum, Myriophyllum heterophyllum, Parthenium hysterophorus, Pennisetum setaceum, Persicaria perfoliata, Prosopis juliflora, Pueraria lobata, Salvinia molesta (Salvinia adnata) and Triadica sebifera (Sapium sebiferum).*
- **Animals**: *Acridotheres tristis, Arthurdendyus triangulates, Callosciurus erythraeus, Corvus splendens, Herpestes javanicus, Lithobates catesbeianus, Muntiacus reevesi, Nasua nasua, Orconectes virilis, Oxyura jamaicensis, Pacifastacus leniusculus, Percottus glenii, Plotosus lineatus, Procambarus clarkia, Sciurus carolinensis, Sciurus niger, Tamias sibiricus and Vespa*

velutina nigrithorax.

Pathways describe the routes and mechanisms by which invasive alien species are introduced and spread. The increasing rate of global movement of people and goods has accelerated the rate of biological invasions. Therefore, identifying the pathways by which invasive alien species are introduced and spread to new regions, and understanding the role of the various pathways of introduction are essential to minimise the risk of invasion, as well as the impacts of invasive alien species on biodiversity, population health and the economy.

For established invasive alien invasive species with viable populations, knowledge of the pathways of introduction allows measures to be taken to stop new individuals entering. For invasive alien species that are new and/or do not yet have widespread populations, controlling the pathways of introduction may allow the flow of individuals and the invasion to be interrupted. For invasive alien species that have not yet been reported in Romania, understanding the priority pathways of introduction can reduce the risk of introduction or facilitate early detection and appropriate intervention to limit the risk of invasion.

The documentation of the pathways of introduction was done with reference to the main mechanisms of introduction, i.e. intentional or unintentional introduction, and considered to fall into the following major categories according to Hulme et al. (2008):

- **release** - refers to the intentional introduction of living alien organisms for human use into the natural environment. Examples include biological control, erosion control, fishery, forestry or hunting utilisation, landscape enhancement and the introduction of threatened organisms for conservation purposes.
- **escape** - refers to the spreading of (potentially) invasive alien species from captivity (e.g. in zoos, aquaria, botanical gardens; agriculture, horticulture, aquaculture and mariculture; scientific research or breeding programmes; or from keeping as pets) into the natural environment. By this pathway, the organisms were originally intentionally imported, but then unintentionally escaped from their original use. This can include accidental or irresponsible release of living organisms.
- **contaminant** - refers to the unintentional introduction of living organisms as contaminants of goods, which are intentionally transferred through international trade, development assistance, emergency aid. Examples include pests and diseases associated with food, seeds, timber and other agricultural, forestry and fish products.
- **stowaway**- unintentional introduction - refers to the transfer of living organisms attached to transport vessels, equipment and associated means. The physical means of clandestine transport are diverse: ballast water and sediments, biofouling, associated with boats, offshore oil and gas platforms and other vessels, dredging equipment, fishing, civil aviation, sea and air containers. Stowaways can be carried by any other vehicle and equipment for human activities, military activities, emergency relief, aid and response, international development assistance, waste dispersal, recreational boating, tourism (e.g. tourists and their luggage).
- **corridor** - unintentional introduction - corridor refers to the movement of non-native organisms into a new region after the construction of transport infrastructure without which it would not have been possible to spread. Such trans-biogeographical corridors include international canals (connecting river basins and seas) and cross-border tunnels linking mountain valleys.
- **unaided** - refers to the secondary natural dispersal of invasive alien species that have been introduced via any of the previous pathways.

In Romania, at the time of the preparation of the plan, the presence of **506 alien species** was documented: 244 terrestrial invertebrate species, 130 plant species, 57 marine species, 48 vertebrate species and 28 freshwater aquatic invertebrate species[7].

Among the priority areas of invasion of invasive alien species in Romania are the Danube River, the port of Constanța and the borders with Moldova and Ukraine.

Economic activities can be both pathways of introduction and factors influencing the spread of

[7] http://www.invazive.ccmesi.ro

invasive alien species. The direct or indirect use of alien invasive species, the use of raw materials/products sourced from other geographical regions, the high connection to road, rail and ship transport flows, their intensity and the responsibilities that different actors assume in relation to environmental legislation significantly differentiate economic activities with regard to the management of alien invasive species.

With the increase in transport, in particular shipping, the number of invasive alien species associated with such a means/vector of transport has also increased. In the case of aquatic species, they may be transported via ballast water or as *fouling*. In this way, a wide range of organisms are able to reach areas where they would never have had a chance to go naturally. Many do not survive transport but some species establish self-sustaining populations in newly invaded regions and can become invasive. For example, the Veined Rapa Whelk *Rapana venosa* (rapana), native to the Sea of Japan, was introduced to the Black Sea via ship transport. The introduction of this predatory mollusc into the Black Sea ecosystem has profoundly altered native Benthic communities and contributed to the decline of oyster populations.

Road and rail transport are also important in the introduction of invasive alien species, through the goods transported, but also through the unintentional transfer of organisms or parts of organisms.

Human settlement management can influence the population dynamics of invasive alien species. The management of green spaces is of very high relevance, as it can contribute to the problems caused by invasive species by: (a) intentional planting of alien species considered aesthetically valuable, such as *Fraxinus pennsylvanica*, *Acer negundo, Prunus serotina, Reynoutria japonica*; (b) maintenance activities, which may allow seed development and dissemination (e.g. by developing the canopy and thus increasing the amount of associated seed); (c) undocumented activities of removal of species identified as invasive, such as uprooting or cutting of *Ailanthus altissima* and *Fraxinus pennsylvanica,* which lead to the development of more individuals; (d) uncontrolled dumping of green waste, especially of vegetative parts important for dissemination, i.e. cut branches and seeds.

On the other hand, urban areas, characterised by low soil fertility, the presence of waste or contaminants, limit the diversity of species that can occupy such habitats. Some invasive plant species, such as *Ailanthus altissima, Amorpha fructicosa* and *Ambrosia artemisiifolia,* can proliferate in the absence of management of this land. At the same time, wastelands and abandoned infrastructure can provide favourable habitats for a range of tolerant animals that are readily adaptable to a wide range of natural and semi-natural habitats, including anthropogenic habitats. For example, *Mediodactylus kotschyi* (gecko) and *Podarcis siculus* (Italian Wall Lizard) have established populations in habitats including abandoned infrastructure and masonry.

For many invasive alien species, transport infrastructure is both a pathway of introduction **and a means of expanding their range**. Increased problems with invasive alien species as a result of different approaches to the management of these infrastructures may occur during both the construction/modernisation and operational periods. The construction and operation of infrastructure networks alter the ecological characteristics of adjacent habitats, leading to changes in the way they are used by flora and fauna species. There is an increased risk of introduction of invasive alien species during the construction of new infrastructure or rehabilitation/modernisation of existing infrastructure. Areas of land from which natural vegetation has been removed (or areas where working material is stockpiled) are exposed to colonisation, and some invasive plant species, such as *Amorpha fruticosa*, may find here the optimal territory for rapid growth. At the same time, the material used as a substrate in terracing and reinforcement can be a source of introducing new species into the area where the work is taking place. During infrastructure operation, lack of vegetation management (e.g. in the forest protection zone) may lead to the dispersal of invasive alien species. Examples of species found are: *Xanthium orientale* (occurs mainly in clogged gullies along roadsides), *Sorghum halepense* (in road protection areas).

In relation to transport infrastructures, **ports** and airports, especially those mainly intended for freight traffic, are highly relevant for the management of invasive alien species. Thus, the Port of Constanța represents one of the most important pathways for the introduction of invasive alien species (Anastasiu et al. 2009; Memedemin et al. 2016).

Invasive alien species have become one of the greatest threats to global biodiversity (Early et al.

2016). The situation is also worrying because their negative impacts on biodiversity are likely to increase in the long term, in particular by linking the negative effects of biological invasions to other drivers of change such as global warming, the expansion of human-managed areas and the fragmentation of natural ecosystems.

Invasive alien species threaten biodiversity in many ways, with their effects observed at all levels of organisation, from individuals to populations, species, communities of organisms and ecosystems. The main negative impacts on biodiversity in Romania manifest themselves through changes in biological communities, hybridisation, excessive predation and competition, disease and pest transmission.

Human health can be directly affected by plants if they are toxic and parts of the plants (or derived products) come into contact with the skin or are ingested (e.g.: *Senecio inaequidens*, *Datura stramonium*, *Heracleum sosnowskyi*). Plants can also be potentially allergenic to humans, causing a range of at least unpleasant effects, even at large spatial scales (Lazzaro et al. 2018).

Ambrosia artemisiifolia, a plant of North American origin that is also widespread in Romania, is one of the few invasive species whose direct impact on human health has been extensively researched. In Europe, *A. artemisiifolia* is considered one of the main causes of allergic rhinitis. A single plant produces billions of pollen grains that can be transported over huge distances. Its pollen is a strong allergen, causing upper respiratory tract diseases in August-September.

For plants, the effects of terrestrial alien species are better documented than those caused by freshwater species. In addition, although certain algae and cyanobacteria can produce blooms that lead to toxin contamination of water sources with chronic and acute negative effects on humans, their impact (and the impact of invasive micro-organisms in general) on human health has been little studied.

Losses caused by invasive species in Europe are estimated at €12 billion annually (Kettunen et al., 2009), but are considered significantly underestimated because not all invasive species and impacts are known (Vila et al., 2011). Recent studies emphasise that, despite differences between regions or taxonomic groups, the economic costs associated with the impacts of biological invasions are increasing globally (Haubrock et al. 2022).

The priority areas receiving the highest impacts associated with invasive alien species are: agriculture (21%), forestry (20%), fish farming (19%), trade (12%), human settlements management (8%), transport (4%) and green space management (4%).

In the forestry sector, areas with acacia stand out in particular, accounting for 255 485 ha (3.8% of the national forest area), but which are already considered part of the national forest stock. Negative impacts in forestry are associated with *Amorpha fruticosa*, introduced in the Danube meadow in associations of *Salix* spp. to protect the banks, which has become widespread and is affecting natural habitats along the river and its tributaries, including the Danube Delta.

Beyond the negative effects on the economy, the real value of the damage caused by invasive alien species is still a complex issue that needs to be analysed in detail. In trade, **transport,** tourism and human settlements management, the impacts of invasive alien species are poorly documented.

Adventive (invasive) plants

Adventive plants are those plant taxa in a given area whose presence is due to their accidental or intentional introduction as a result of human activity [Richardson et al. 2000; Pyšek et al., 2002].

The invasion of adventive species is now recognised as one of the main threats to biodiversity [Pauchard & Alaback 2006], ecosystem structure and function [Davis & Thompson 2000; Levine et al. 2003; Zedler & Kercher 2004; Stinson et al. 2006], the conservation of protected areas [Pauchard & Alaback 2006], and causes enormous costs in agriculture, forestry, fisheries and other economic sectors, as well as in human health.

The impacts of adventive plants on natural ecosystems can manifest themselves in the following ways:

- *Elimination of rare or endangered species from native flora by invasive adventive plant species.*

For example, *Robinia pseudacacia* L. (acacia) is a North American species, introduced to Europe in the XVII century, as an ornamental plant in the Botanical Garden in Paris. Subsequently, the species was widely cultivated in Europe as an ornamental plant, melliferous honey, for forestry uses, etc. Wherever it was introduced, acacia spread rapidly and, with its high growth rate, in many places formed dense populations that shaded the land, hindering the growth of halophytic species and displacing native vegetation [Call 2002; Wieseler 2005; Wittenberg 2005]. In North America, acacias pose a serious threat to native vegetation in dry, sandy prairies, oak savannas, and forest edge savannas [Wieseler 2005]. Nitrogen accumulation in the soil due to the root nodules of acacia can cause serious problems in the conservation of native vegetation by stimulating nitrophilic species; also, by very intense transpiration, acacia dries up the soil of water, reducing water availability for other plants [Bartha et al. 2008].

- *Competition of adventive species with native vegetation for space, light, water and nutrients*

The immediate and direct consequence of competition by invasive adventive species with native species and plant communities in a given region is a rapid decline in the state of natural biodiversity, both in terms of quality and quantity. It has been found, for example, that in central Europe there is a direct relationship between the invasion of the central Asian species *Impatiens parviflora* DC. and the decrease in floristic and phytocoenotic diversity of beech forests. In these forests, *Impatiens parviflora* has almost completely replaced the native species *Impatiens noli-tangere* L. (Touch-Me-Not) [Chmura & Sierka 2006].

Other effects:

- altering natural nutrient and water cycles in invaded ecosystems;
- causing damage to mycorrhising fungi, with direct effects on reducing the vitality of many mycorrhising species;
- causing changes in soil chemistry (elimination of allelopathic substances, etc.), with the effect of modifying the structure of plant communities;
- deterioration of terrestrial and aquatic habitats; for example, the invasion of *Elodea canadensis* and *E. nuttalii* species into European rivers and lakes has led to a reduction in the biodiversity of these ecosystems;
- reducing food sources for native wildlife; for example, the invasion of *Xanthium spinosum* (of South American origin) into grasslands in eastern and central Europe is leading to the elimination of native species that are good forage;
- changes in the succession of phytocenoses, food chains, etc.;
- increased incidence of pathogens and exotic diseases. Invasive weed can cause great damage to the fishing industry, the hydropower industry, and even shipping around the world.

Other economic and social impacts [Levine et al. 2003; Lovel & Stone 2005; Alberternst & Böhmer 2006]:

- in ecosystem conservation and restoration activities: the invasion of species into natural ecosystems implicitly leads to increased costs for their restoration and the subsequent conservation of their component biotic communities.
- in transport: the emergence of adventive species in different geographical areas often leads to the degradation of transport infrastructure and increases the costs of maintaining it.

Reynoutria japonica is considered to be one of the most damaging weed species in most of Europe and North America because:

- dense communities of this plant shade the soil, reducing light access to the ground by more than 90% [Barney et al. 2006];
- leads to reduced biodiversity of native species in invaded habitats [Shaw & Seiger 2002; Wittenberg 2005; Pyšek 2006, 2008; Barney et al. 2006; Alberternst & Böhmer 2006];

- prevents normal vegetation succession and the establishment of native vegetation [Alberternst & Böhmer 2006; Wittenberg 2005; Shaw & Seiger 2002];
- reduces habitat resource availability for amphibians, birds, mammals and other organisms [Forman & Kesseli 2003; Alberternst & Böhmer 2006; Pyšek 2006];
- when the aerial stems of the plant die back in autumn and winter, the bare soil is easily washed away by water, leading to increased erosion, especially on river banks [Wittenberg 2005; Shaw & Seiger 2002].
- causes alteration of the runoff regime and water quality of rivers and deterioration of soil physical properties [Barney et al. 2006].

In addition to the damage to habitats and plant communities, the invasion of *R. japonica* also causes substantial economic damage. It has been estimated that the control (by herbicides) of this species on a national scale in the UK would cost about 1.56 billion pounds (£) [Alberternst & Böhmer 2006].

The prolific growth of rhizomes and shoots can damage foundations, walls, pavements, car parks, roads, railway embankments, drainage works, flood control structures, etc. [Shaw & Seiger 2002; Pyšek 2006, 2008; Wittenberg 2005; Alberternst & Böhmer 2006; Barney et al. 2006]. In addition to the above, this species also causes the following damages [Shaw & Seiger 2002]:

- damage to the tourism industry (invaded areas are less attractive to tourists),
- fall in the exchange value of invaded land,
- crop losses in case of crop invasion, etc.

R. japonica is an invasive weed that is very difficult and costly to control and is regarded as a real pest (like *R.* × *bohemica* or *R. sachalinensis*) in both Europe and North America [Forman & Kesseli 2003; Weston et al. 2005; Wittenberg 2005; Tiébré et al. 2007; Shaw & Seiger 2002]. In many European and North American countries, special legislative measures have been imposed to prohibit the introduction and spread of the species into natural and anthropogenic habitats [Child et al. 1992, cited by Forman & Kesseli 2003; Shaw & Seiger 2002; Forman & Kesseli 2003; Bailey & Conolly 2000, cited by Weston et al. 2005 etc.].[8]

Analysis of the project's potential biological pollution sources

Based on the official and documentary information presented above, with reference and extrapolation to the analysed project, the following sources of potential biological pollution have been identified:

- **Construction stage**
  - Direct and indirect spreading of invasive plant and animal species in the terrestrial and aquatic ecosystem through dredging works, removal of vegetation from water and banks, topsoil removal, displacement and transport of soil and topsoil removed with vegetation debris and dredged material, movement of machinery on temporary and permanent roads.
  - Cumulation of the spread of invasive species with other pressures and threats in protected nature areas of Community importance (PNACIs) and other proposed projects in or near PNACIs.
  - The presence of invasive plants may become permanent during the pressure generating the impact and may affect habitats and plants in the PNACIs, as well as the habitat of herpetofauna, birds and mammals.
  - The presence of large quantities of waste in the water and in the area adjacent to the banks of both Argeș and Dâmbovița rivers represents an increased potential for biological pollution if this waste is reintroduced into the natural circuit by aquatic and terrestrial means and is not collected and properly packaged, together with the adjacent soil layers, which are also contaminated, and transported to landfills.

[8] *The impact of invasion of adventive plants on natural biodiversity, economy and human health: general considerations / Culiță Sîrbu (USAMV IAȘI) /* https://www.uaiasi.ro/PN_2/ALIPLASP/files/invazia plantelor adventive - impact.pdf

- The dredges will uplift sediments contaminated with remnants of biological pollutants in high concentrations from the bottom of the two riverbeds and return them to a new circuit by creating a new cascading chain of polluting effects. This impact will be more intense at the beginning of the construction works, diminishing over time through dilution in the large volume of water, until total disappearance, as long as there is a proper management.

➢ **Operation stage**

- Manifestation of an ecological imbalance in the terrestrial and aquatic environment caused by the spread of invasive flora and fauna species during the construction phase. This impact may propagate throughout the entire waterway and adjacent areas (ports, junctions, roads, railways, etc.) and may be permanent throughout the lifetime of the project.
- Planting of shrub and tree invasive planting material on the banks of the navigable canal and in service areas, adjacent areas. This impact may be episodic throughout the life of the project.
- The transport and spreading by vessels of spores, seeds, eggs, fries, larvae, parts of organisms and whole organisms of invasive species downstream (Danube River) and upstream (Argeș and Dâmbovița Rivers). This impact may be permanent throughout the life of the project.

For some of these sources of potential biological pollution, preventive measures are recommended in Chapter 8

3. Analysis of alternatives

3.1 The "No-Project" alternative

This alternative means maintaining the current situation with negative effects both on the environment and on the structure, leading to a marked degradation of the objectives realised or still in the process of realisation.

The aim of the project is to develop the two watercourses (Argeș and Dâmbovița rivers) in order to improve and extend the naval traffic, implicitly the transport of people but especially the commercial traffic with positive effects on the economy.

The initial project was started in 2008 - 2009, then in a later stage in 2012. In these two previous time periods, some of the proposed objectives have been realised, leading to the situations with partially completed works, as described in section 2.3.1. (table 4-6).

In the No Project scenario, the current state of the economy will be maintained, new jobs will not be created in the area where the project will be developed and the objectives for which the project was originally designed will not be met.

From the point of view of environmental factors, the non-implementation of the project means that the current state of the environment (environmental factors) will be preserved, the aforementioned land areas will not be occupied, the population in the neighbouring areas will not be affected by road traffic that could be generated by the transport of heavy goods vehicles.

3.2 The "Do-Project" alternative

The project variant implies the realisation of the works as foreseen in the technical part, as described in the previous chapters.

Project works include:

- proposed works on the Argeș river
- proposed works on the Dâmbovița river

- description of the proposed works to be carried out for the ports of Bucharest - 1 Decembrie, Oltenița, Bucharest - Glina
- works proposed to be carried out in the area of the hydrotechnical nodes.

For this alternative two variants were analysed, as described below.

❖ ***Variant 1***

The route of the waterway leaves the Danube at km 432 on the river (km 0+000 on the development). It follows, with minimal rectifications, the minor riverbed up to the port of Bucharest - 1 Decembrie at km 72+134 of the development.

Navigational improvements consist of regularising the course of the river in plane, diking and damming it and sectioning it by means of steps (hydrotechnical nodes).

Upstream of the port of Bucharest - 1 Decembrie, a bottom sill has been planned at km 73+423, linking the navigable sector with the upstream dammed area. On this sector the thalweg is maintained at the current level up to the dam of the Mihăilești - Cornetu reservoir (km 83+052).

In variant 1, the navigable fairway up to the bottom sill is 73.423 km long. There are 52 bends on this route, 23 of which have radii of 1,000 metres and greater, and 29 bends have radii of 750, 800 and 850 metres.

❖ ***Variant 2***

The route of the waterway in this variant has been designed taking into account the requirements of WG 20-2006 PIANC Guidelines, which foresee stringent manoeuvrability conditions for vessels/convoys. Changes have resulted on the section between km 5+516 and km 14+207. On this section, these corrections were made with the aim of ensuring that the minimum alignment between bends is greater than 220 m - in the case of bends in the same direction - and greater than 330 m in the case of bends in the opposite direction. This ensures normal, unrestricted manoeuvrability conditions for the designed convoy.

In this variant, the port of Bucharest is located at km 72+000, and the total length of the development, up to the bottom sill, is 73.289 km.

In variant 2 (the optimal variant proposed for implementation) the fairway has 45 bends, of which 22 have radii of 750, 800 and 850 m, and 23 bends have radii of 1000 m and greater. On the section upstream of the bottom sill from km 73+289 up to the Mihăilești - Cornetu reservoir dam (km 82+918), the planned control works are identical to those of variant 1.

From the economic point of view, the implementation of the project implies a development of the area, through naval traffic on the two rivers, the intensification of the economy, through the development of the activity in the ports proposed, the creation of new jobs, both during the execution of the works and afterwards, the development of trade at the level of the local administrative units by increasing the number of people employed.

In terms of environmental factors, a negative impact will be felt through the permanent occupation of certain areas of land by the proposed developments to be realised, as presented in Annex 3 of the study. Also, during the execution of the works, there will be an impact on environmental factors through road traffic in the work zone, in the riverside areas that will be crossed by vehicles transporting the materials necessary for the execution of the works, the operations that will be carried out on the site (demolition, loading / unloading of materials, loading of waste resulting from demolition, storage of used materials, etc.), temporary occupation of some areas of land for the organisation of the site, of the work zones, accidental spills of materials containing hazardous products / chemicals on the ground, etc.

3.3 Sustainability of the implementation of the investment objective

3.3.1. Social and cultural impact, equal opportunities

The control works on Argeș and Dâmbovița rivers is a long-term regional development axis, and the

economic and social influences in the territory, especially through objective developments and related activities create new jobs, absorbing unemployment.

From a territorial point of view, the area between the Argeș and Dâmbovița rivers, together with the riverside area on both banks, is the area that will benefit the most after the works are completed. **Logistic zones** and possibly **industrial parks** will be developed in the neighbourhood of the ports.

In view of the legislative provisions in force, the proposed investment complies with all policies and practices whereby no distinction, exclusion, restriction or preference is made, irrespective of: race, nationality, ethnicity, language, religion, social category, beliefs, gender, sexual orientation, age, disability, illness, belonging to a disadvantaged category, as well as any other criterion that has the purpose or effect of restricting, removing the recognition, use, or exercise, on equal terms, of human rights and fundamental freedoms or rights recognised by law, in the political, economic, social and cultural or any other areas of public life.

3.3.2. Estimates of the labour force employed by the implementation of the investment: during the execution phase, during the operation phase

The labour force employed represents the number of jobs created in the execution phase as well as the number of jobs created in the operation phase.

During the implementation phase, about. 17.100 temporary jobs will be created during the construction phase, while the permanent labour force generated during the project operation period is estimated at approx. 50 jobs.

3.3.3. Impacts on environmental factors, including impacts on biodiversity and protected sites

The projected works do not introduce major negative effects on soil, drainage, microclimate, surface water, vegetation, fauna or landscape.

The proposed works, by their nature, will contribute to the stability of the embankments by reinforcing them, thus constituting a safety element. The building materials used are natural (earth, ballast, stone, straw) or concrete (inert material in contact with water). Spills of building materials (cement mortar in particular) or fuels are the only sources of water pollution.

During the period of operation of hydrotechnical works, water pollution can be caused by:

- direct deposition of pollutants from ship and car traffic on the water's surface;
- discharging non-purified wastewater directly into outfalls;
- discharging of water potentially polluted by accidentally produced toxic and/or hazardous substances into outfalls.

Measures to protect water quality:

- waste of all types will be collected and stored in specially designated areas, to be disposed of or recovered according to its specificities.
- fuels and hazardous substances will be stored in special places.
- in order to eliminate the danger of infestation of soil and groundwater with petroleum products, it is necessary to properly maintain the machines and to carry out oil changes in special stations for such operations, as oils and greases are highly polluting.

3.3.4. Impact on air

The main sources of construction-specific air pollution are:

- activity of construction machinery;
- transport of construction materials (earth, concrete, raw and/or crushed stone, etc.).

Machinery, regardless of their type, run on diesel engines, and the exhaust gases discharged into the atmosphere contain entire range of pollutants specific to the internal combustion of diesel: nitrogen oxides (NOx), volatile organic compounds (VOCs), methane (CH_4), carbon oxides (CO, CO_2), ammonia (NH_3), heavy metal particulates (Cd, Cu, Cr, Ni, Se, Zn), polycyclic aromatic hydrocarbons (PAHs), sulphur dioxide (SO_2).

The range of organic and inorganic pollutants emitted into the atmosphere through exhaust gases contains substances with varying degrees of toxicity.

In addition to the common pollutants (NO_x, SO_2, CO, particulate matter), there is also nitrous oxide (N_2O) - an ozone-depleting substance - and methane, which together with CO_2 have global environmental effects as greenhouse gases.

The amounts of pollutants emitted into the atmosphere by construction machinery depend mainly on the following factors:

- engine technology level;
- engine power;
- fuel consumption per unit of power;
- machine capacity;
- age of the machine/engine;
- equipping with pollution abatement devices (catalysers).

It is clear that pollutant emissions decrease as engine performance is better, with the worldwide trend towards engines with the lowest fuel consumption per unit of power and the most stringent emission controls.

During operation, there is no main source of air pollution, except for the car traffic on the roads in the vicinity of the navigable canal and the ship traffic on the canal.

Air quality protection measures during the period of execution of the works

- regular maintenance of machinery and means of transport will be ensured in such a way that the level of emissions from flue gas is within the limits laid down by the legislation in force;
- modern technology will be used for the production of concrete, with plants equipped with filters to retain the powders;
- soil and other powdery materials should be transported under cover (plastic sheeting or tarpaulins);
- within the human settlements, site access roads will be watered periodically to avoid the emission of suspended dust.

4. Description of relevant aspects of the current state of the environment

4.1 Water. Water bodies

The project that is the subject of this report is located in the Argeș - Vedea river basin.

The Argeș-Vedea catchment area represented in Figure 14 is located in the southern part of the country, neighbouring the Olt catchment (to the north and west), the Danube river to the south and the Ialomita catchment to the west. From the administrative point of view, the Argeș-Vedea river basin covers the territory of 7 counties and Bucharest municipality, namely: Argeș, Giurgiu, Teleorman, Ilfov and smaller parts of Dâmbovița, Olt and Călărași counties. The total population is about 3.6 million, with a population density of 167 inhabitants/km^2. The main urban agglomerations are: Bucharest, Piteşti, Giurgiu, Alexandria.

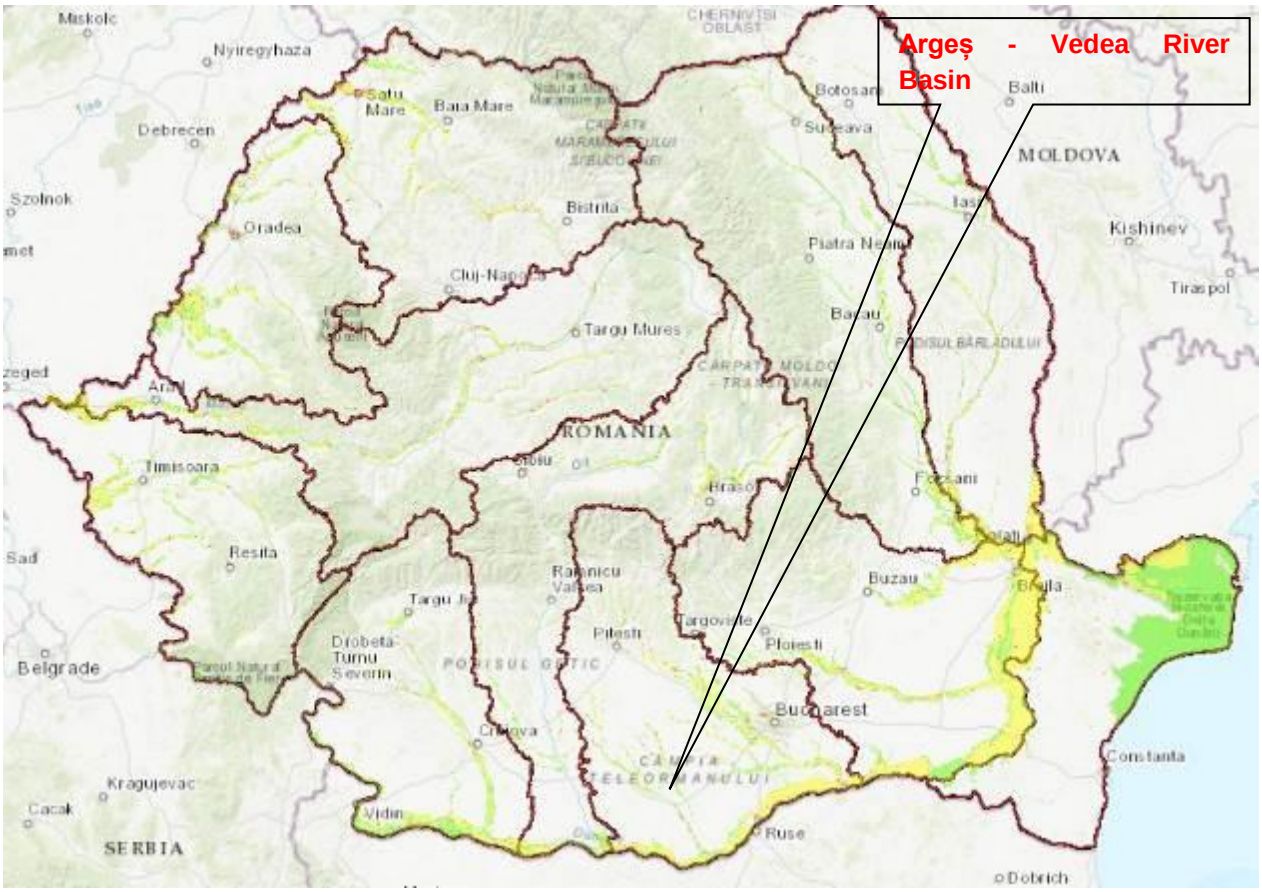


Figure no. 14 - Delimitation of the river basin

The total surface area of the Argeș-Vedea river basin is 21543.20 km ^{2}, representing 9.04% of the country's surface area. In Romania, the Argeș-Vedea catchment area includes the Argeș, Vedea and Călmățui sub-basins (and part of the Danube basin). The river network comprises 274 surveyed watercourses with a total length of 7039 km and an average density of 0.33 km/km^2.

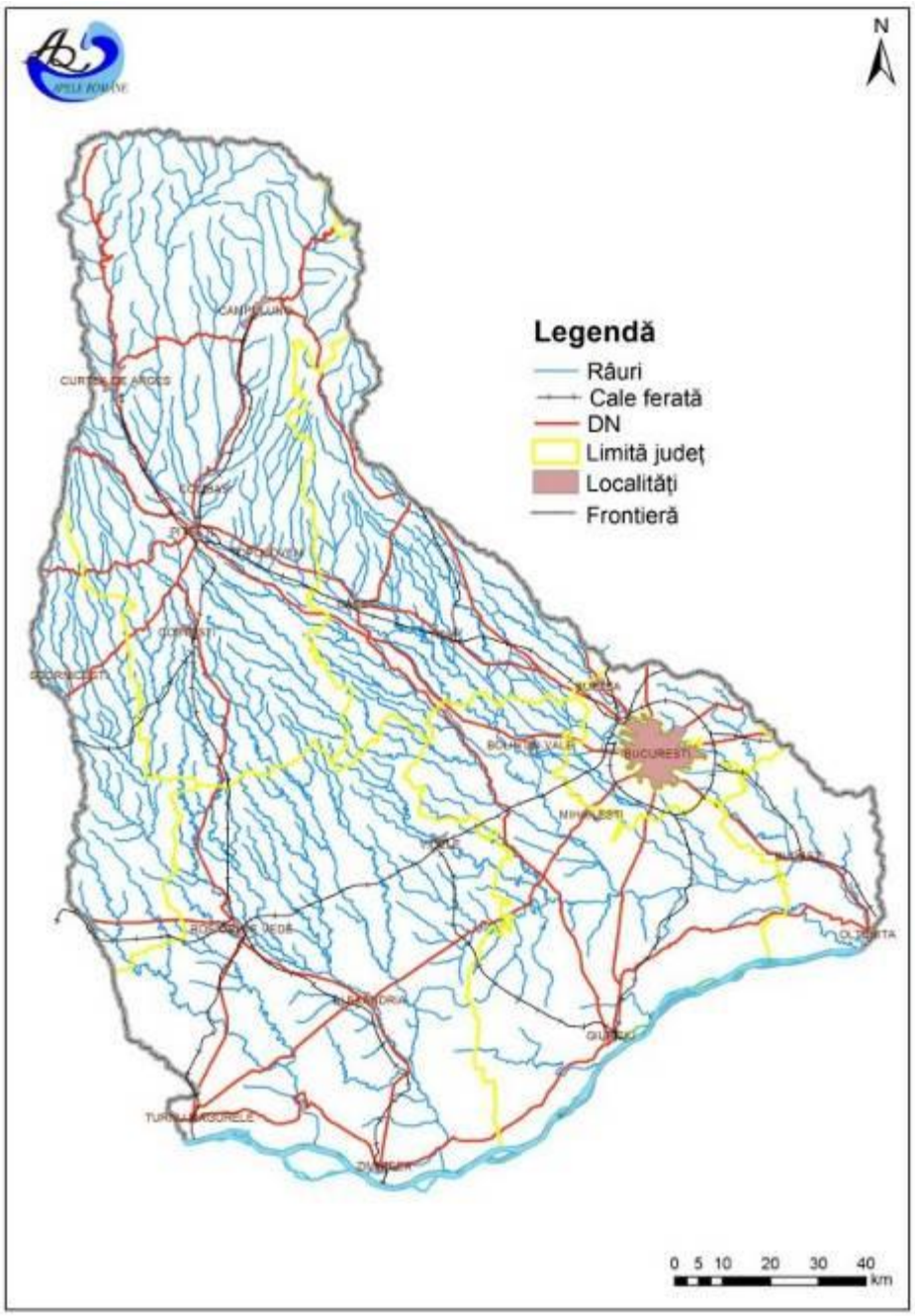


Figure no. 15 - Argeș - Vedea River Basin

The total surface water resources in the Argeș-Vedea river basin total about 2365 million m^3/year, of which usable resources are about 1741 million m^3/year. They represent approx. 66% of total resources and are formed mainly by the rivers Argeș and Vedea and their tributaries.

In the Argeș-Vedea hydrographical area (shown in Fig. 15) there are 40 reservoirs - shown in Fig. 17 below (with a surface area of more than 0.5 km^2), which total a net volume of approx. 860 million m^3, of which 19 are important due to their complex use and a net volume of 603.16 million m^3.

In relation to the population of the basin, the specific usable resource is about 484 m^3inhabitant/year, and the specific resource calculated on the theoretical available stock (multiannual average) is about 660 m^3/inhabitant/year. The water resources in the Argeș-Vedea hydrographical area can be considered as totally unevenly distributed between the 3 sub-basins Argeș, Vedea and Călmățui. The multiannual mean flows for the main rivers in the catchment area range between 1.5 m^3/s (Călmățui), 7.5 m^3/s (Vedea) and 46.0 m^3/s (Argeș).

Of the total length of the surveyed watercourses in the Argeș-Vedea river basin, non-permanent

watercourses represent about 47.59%.

In the Argeș-Vedea hydrographic area, the theoretical underground resources are estimated at 1228 million m^3 and the usable ones reach 1037,012 million m^3, of which about 104 million m^3 come from groundwater sources and about 933 million m^3 from deepwater sources.

The navigable waterway - has a length of 73 km on the Argeș river and takes up a difference in level of 53 m through 4 hydrotechnical nodes (HNs), and on the Dâmbovița river a length of 31 km with a difference in level of 14.60 m, taken up by 2 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and 40.0 m on the Dâmbovița river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.

The location of the project is on the Argeș river downstream of the Adunații - Cornetu lake, on the territory of Ilfov, Giurgiu and Călărași counties.

4.1.1. Surface water bodies

The **site of the works** is located on the Argeș river (cadastral code X.1) downstream of the Mihăilești - Cornetu lake and on the Dâmbovița river (cadastral code X.1.25) downstream of the bridge on the Bucharest ring road, in the counties of Ilfov, Giurgiu and Călărași.

According to the typology of surface watercourses presented in Figure 16, the site area is located in the area of *RO06 - Watercourse located in lowland*, *RO10* - Watercourse sector located in lowland*, F>5000 km^2, ECO 12.

Water body *RO06 - Water course located in lowland*, with a surface area of 10 - 2000 km^2, with a siliceous geological structure and a lithological structure of sand, silt, silty clay. The slope is <8‰.

Water body *RO10* - Water course sector located in lowland, F>5000 km^2, ECO 12*, with a surface area > 3000 km^2, with a siliceous geological structure and a lithological structure of sand, silt, clay. The slope is between 0.5 -5‰.

The Argeș River is a watercourse in S-SE Romania, tributary of the Danube at Oltenița. It covers 350 kilometres and has a catchment area of 12,550 square kilometres. It springs from the centre-western part of the main ridge of the Făgăraș Mountains through two tributaries: Buda and Capra.

The Argeș River springs in the Făgăraș Mountains, in the centre of the country, flowing, after a 250 km long course, into the Danube, in the southern part of the country (Oltenița) (fig. 17).

The **Dâmbovița River** is a watercourse in Romania, a tributary of the Argeș River. The river springs in the Făgăraș Mountains on the slope of the Curmătura Oticului mountain. The upper course from the springs to the confluence with the Boarcășu is also known as the Oticu spring with the Oticu River. On its way to the Argeș, the river crosses several landform units: Făgăraș Mountains, Iezer-Păpușa Mountains, Leaota Mountains, Getic Subcarpathians and Curbură Subcarpathians, Getic Plateau, High Plain of Târgoviște, Titu Plain, Bucharest Plain and Burnazului Plain.

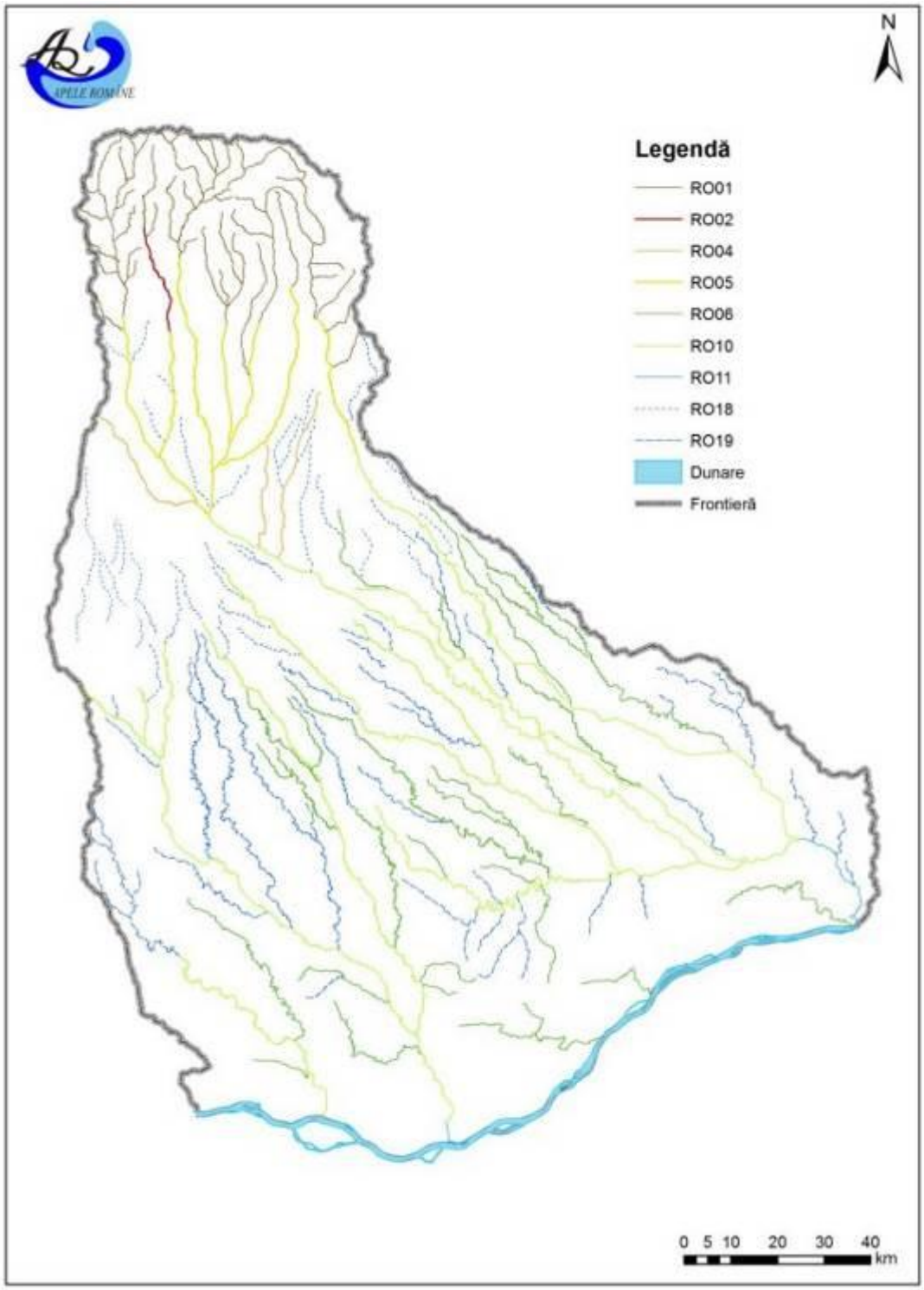


Figure no. 16 - Typologies of surface watercourses

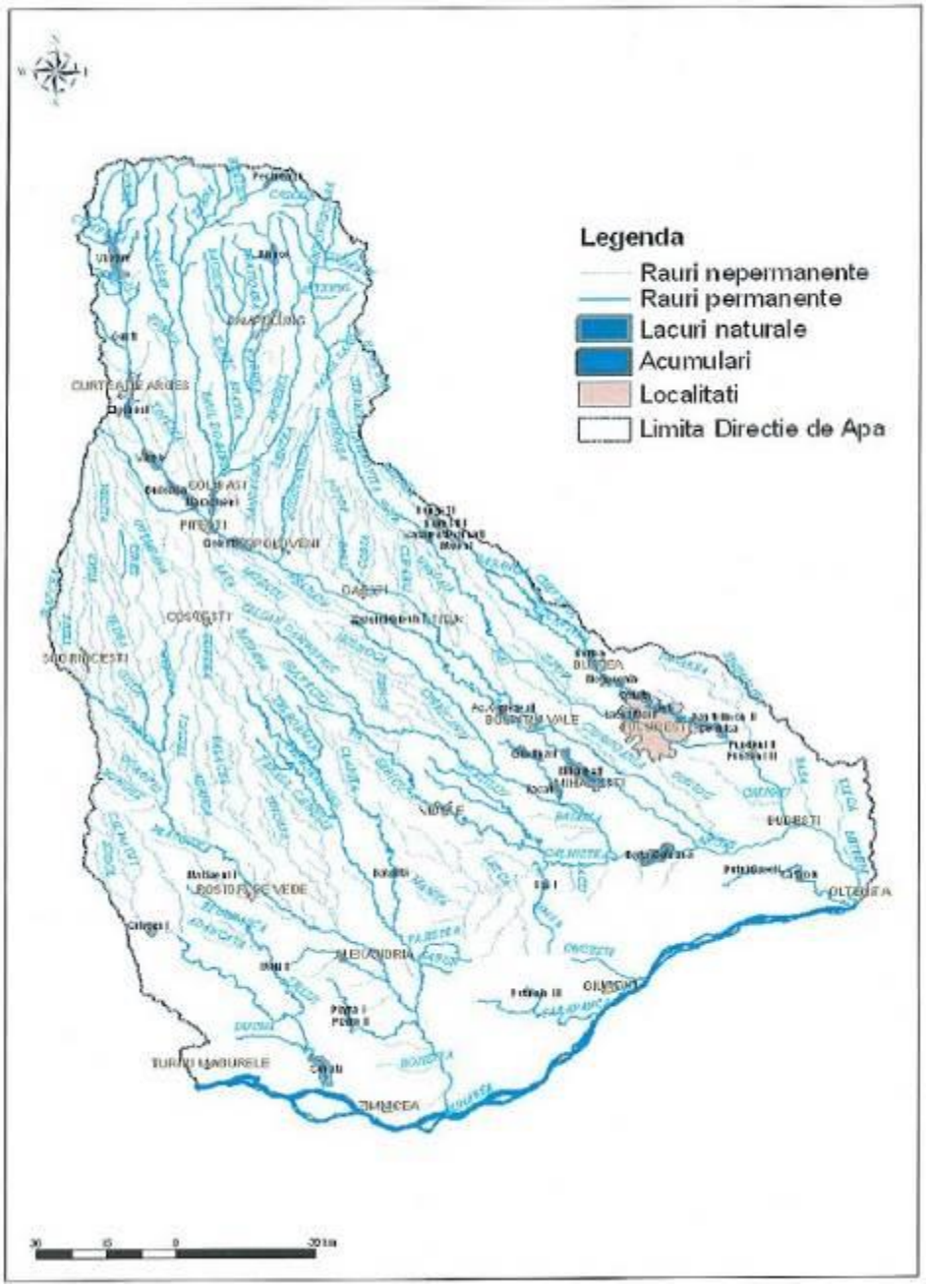


Figure no. 17 - Argeș river basin

The surface water bodies identified in the UPDATED MANAGEMENT PLAN FOR THE ARGEȘ-VEDEA RIVER BASIN AREA, prepared in accordance with the requirements of Article 13 of the Framework Directive 2000/60/EC, on which the project is located are:

Name of water body: Dâmbovița: downstream of Lacul Morii reservoir - control works for discharge of Apa Nova (Glina);
Water body: RORW10-1-25_B8;
Water body character: heavily modified water body;
Water body length: 17 km
Type: RO10*CAPM (stretch of watercourse located in the lowland).

The surface water body RORW10-1-25_B8 on which the project is located overlaps with the groundwater body ROAG03 - Colentina, ROAG11 - Bucharest - Slobozia (Mostiștea sands), ROAG12 - East of the Wallachian Depression.

Name of water body: Dâmbovița: upstream of the discharge Apa Nova (Glina) - conf. Argeș;
Water body: RORW10-1-25_B9;
Water body character: heavily modified waterbody;
Water body length: 31 km;
Type: RO10*CAPM(stretch of watercourse located in the lowland).

The surface water body RORW10-1-25_B9 on which the project is located overlaps with the groundwater body ROAG03 - Colentina, ROAG12 - East of the Wallachian Depression, ROAG11 - Bucharest - Slobozia (Mostiștea sands).

Name of water body: Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the Danube;
Water body: RORW10-1_B7;
Water body character: heavily modified waterbody;
Water body length: 30 km;
Type: RO11*CAPM (stretch of watercourse located in the lowland).

The surface water body RORW10-1_B7 on which the project is located overlaps with the groundwater body ROAG05 - Argeș river meadow and terraces, ROAG11 - Bucharest - Slobozia (Mostiștea sands), ROAG12 - East of Wallachian Depression,

Name of water body: Argeș: section downstream of Mihăilești reservoir - upstream of the confluence with the Dâmbovița river;
Water body: RORW10-1_B6;
Water body character: heavily modified waterbody;
Water body length: 57 km;
Type: RO10*CAPM (stretch of watercourse located in the lowland).

The surface water body RORW10-1_B6 on which the project is located overlaps with the groundwater body ROAG05 - Argeș river meadow and terraces, ROAG11 - Bucharest - Slobozia (Mostiștea sands), ROAG12 - East of Wallachian Depression.

4.1.2. Quality of surface water bodies

To assess the status of water bodies, mainly monitoring data from 2013 were used. For biological elements that are monitored less frequently, the most recent monitoring data were used. Where monitoring sections were not established at the water body level, the principle of water body grouping was applied. In the cluster assessment, data were generally taken from a single monitored water body.

For the water bodies for which no monitoring data are available and for which no grouping was possible, the status assessment was based on the risk analysis (non-achievement of environmental objectives), i.e. presence/absence of significant chemical and hydro-morphological pressures existing at the 2013 level. The above approaches are the same as those applied in the first Management Plan. The assessments made, for some of the situations presented below, refer to the quality element level for physico-chemical elements and to the element group level for physico-chemical parameters.

At the level of the Argeș-Vedea catchment area, 181 water bodies (111- natural and 70 - heavily modified/artificial) were analysed and characterised in terms of their ecological status/potential and chemical status, of which:

- 63 water bodies (representing 56.76% of natural water bodies and 34.80% of 181 water bodies) are in good ecological status and 23 water bodies (representing 32.85% of heavily modified/artificial water bodies and 12.70% of 181 water bodies) have a good potential.
- 103 natural water bodies (representing 92.8% of natural water bodies and 56.9% of 181 water bodies) are in good chemical status and 63 heavily modified/artificial water bodies (representing 90% of heavily modified/artificial water bodies and 34.81% of 181 water bodies) are in good chemical status.

In the project site area, as can be seen in the figure below *(source: Argeș - Vedea River Basin Management Plan*), water quality is moderate.

The characterisation of the ecological status of water bodies - rivers (110 water bodies) was carried out on the basis of benthic invertebrates, fish fauna, phytobenthos and phytoplankton, general physico-chemical parameters and specific pollutants. The hydromorphological elements were only considered in the assessment of very good status.

Compared to the ecological status of the first Management Plan, the percentage of water bodies in good ecological status has increased from 25 % to 57.27 %, which indicates an improvement of the ecological status.

The analysis of the ecological status of the current Management Plan at the level of quality element/quality element groups showed that for the biological element consisting of benthic invertebrates, the percentage of water bodies with good status is higher compared to the percentage of water bodies meeting the environmental objectives in terms of ecological status (i.e. 100%).

As regards the group of physico-chemical elements, the analyses carried out showed that they are determinants of the ecological (integrated) status. At the level of the group of physico-chemical elements and specific pollutants, the percentage of water bodies with good status is higher than the percentage of water bodies with good (integrated) ecological status (Fig. 18).

If 57.27% of river water bodies reaches good ecological status, the percentage of river water bodies with good status in terms of specific pollutants is 78.18% and in terms of the group of general physico-chemical elements is 57.27%.

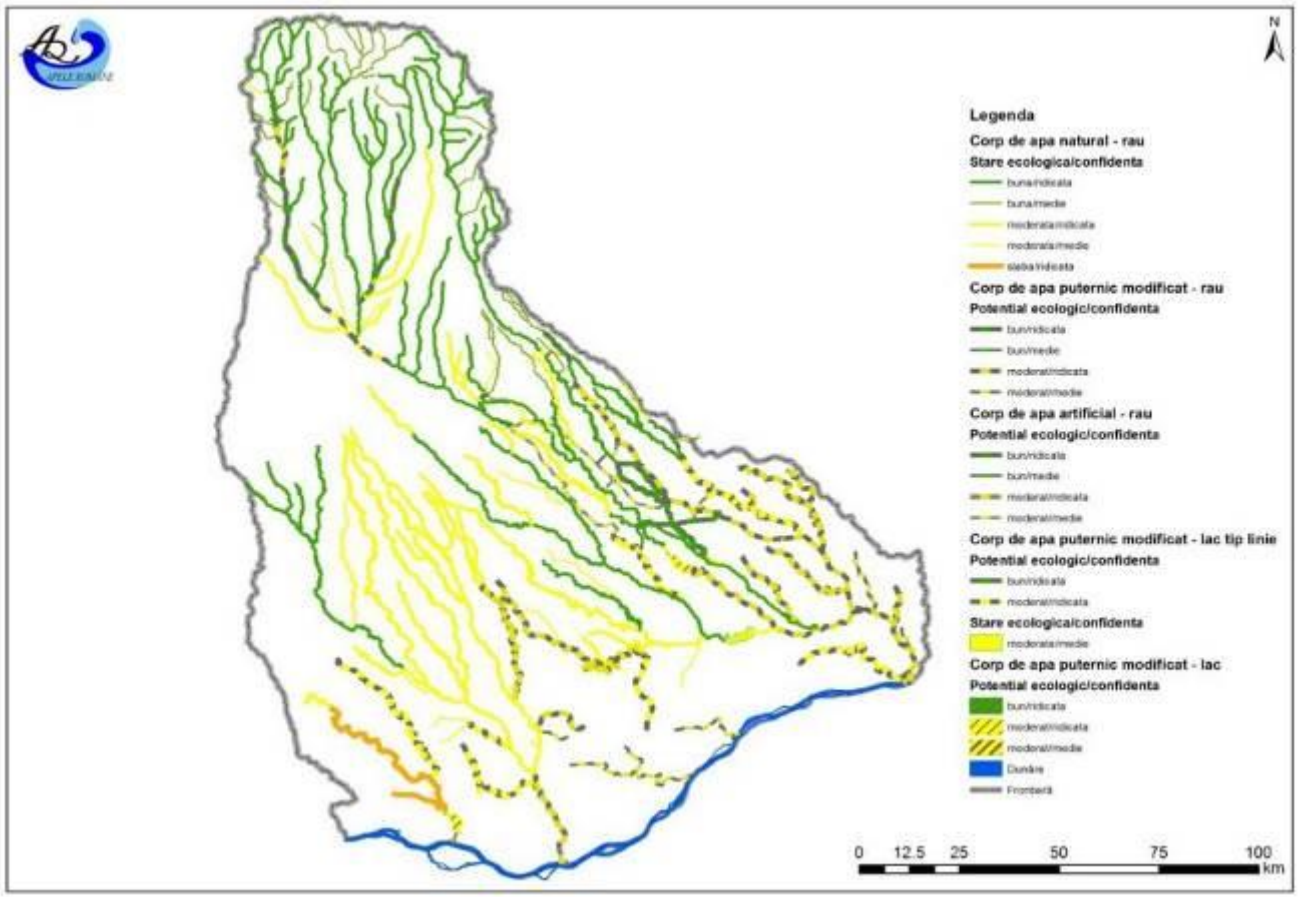


Figure no. 18 - Ecological status and ecological potential of surface water bodies in the Argeș-Vedea catchment area

The assessment of the chemical status of surface water bodies consists in checking the compliance of concentrations of priority substances determined in surface water bodies - categories: rivers, lakes, with the EQS values (AA-EQS and MAC-EQS) of the new EQS Directive for existing priority substances and other pollutants (Fig. 19).

As all surface water bodies in the Argeș-Vedea River Basin were assessed in terms of their chemical status, all subsequent reports refer to the total number of bodies in this river basin area. Thus, 166 water bodies (91.7%) were found to be in good chemical status and the remaining 15 (8.3%) were found not to achieve good chemical status.

At the level of the Argeș-Vedea catchment area, the assessment of the chemical status of surface water bodies was done on the basis of monitoring data for 55 water bodies (30.4%), by grouping (by extrapolation of monitoring data from other water bodies) for 14 water bodies (7.7%) and on the basis of expert judgement for 112 water bodies (61.9%). Compared to the assessment of the chemical status of surface water bodies carried out in the first Management Plan, the percentage of water bodies assessed as reaching good status decreased by 2.9% in the Argeș-Vedea river basin area in the second Plan. A more detailed picture on the evolution of the global chemical status with and without the ubiquitous PBTs.

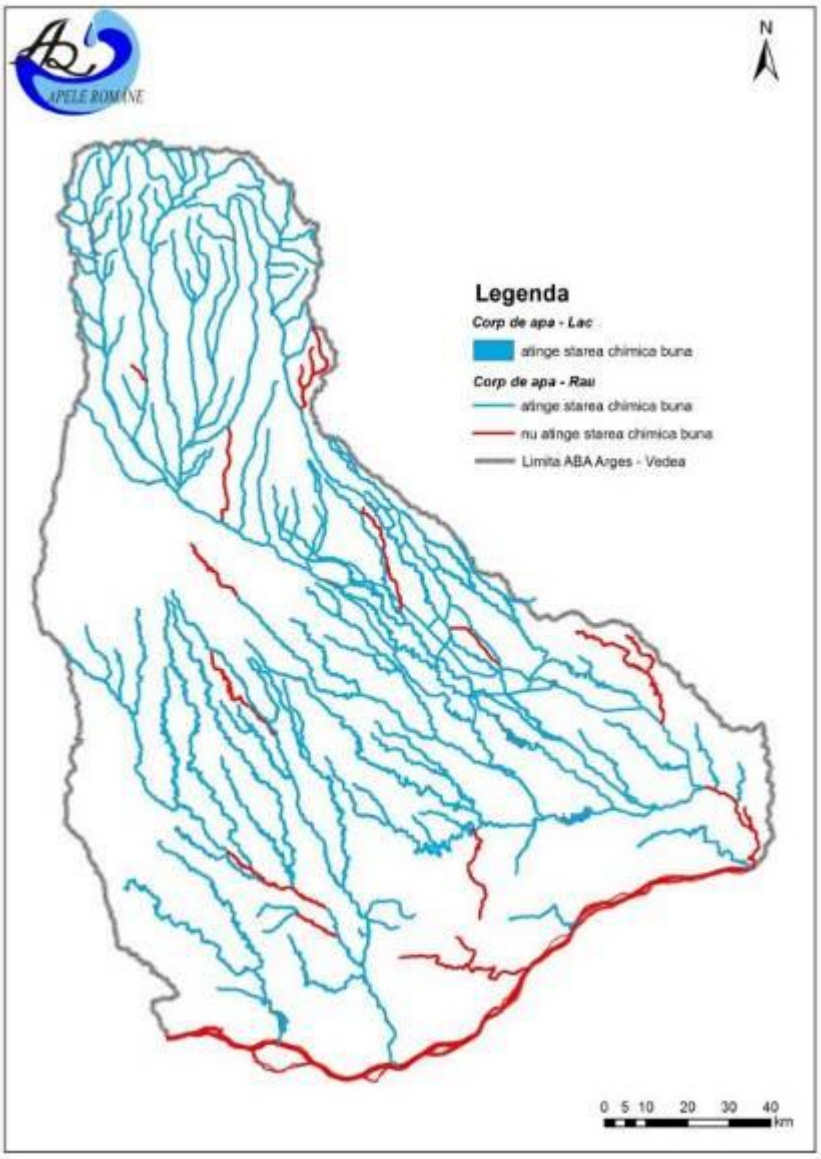


Figure no. 19 - Global chemical status of surface water bodies in the Argeș-Vedea catchment area

4.1.3. Groundwater bodies

A total of 11 groundwater bodies have been identified, delimited and described on the territory of the Argeș - Vedea Water Basin Administration (Fig. 20).

Of the 11 groundwater bodies identified, 10 belong to the porous type, having accumulated in deposits of Quaternary and Lower Pleistocene-Romanian age, and one body belongs to the karst-fissure type, developed in deposits of Jurassic-Cretaceous age. The most groundwater bodies, namely 7 (ROAG02, ROAG03, ROAG05, ROAG07, ROAG08, ROAG09 and ROAG10), were found in meadow and terraces areas of the Argeș and its tributaries, Vedea, Teleorman, Călmățui, as well as Danube, developed in alluvial deposits, porous-pervious, of Quaternary age. Being close to the surface, their level is free. One groundwater body, namely ROAG01 (Piatra Craiului Mountains), is developed in the mountainous area and is of karst-fissure type, being developed in hard rocks, represented by limestones, conglomerates, sandstones, etc. Three other bodies, namely ROAG11 (Bucharest-Slobozia), ROAG12 (East of Wallachian Depression) and ROAG13 (Bucharest), are under pressure, located in upper Pleistocene and lower Pleistocene-Romanian deposits and are of significant economic importance.

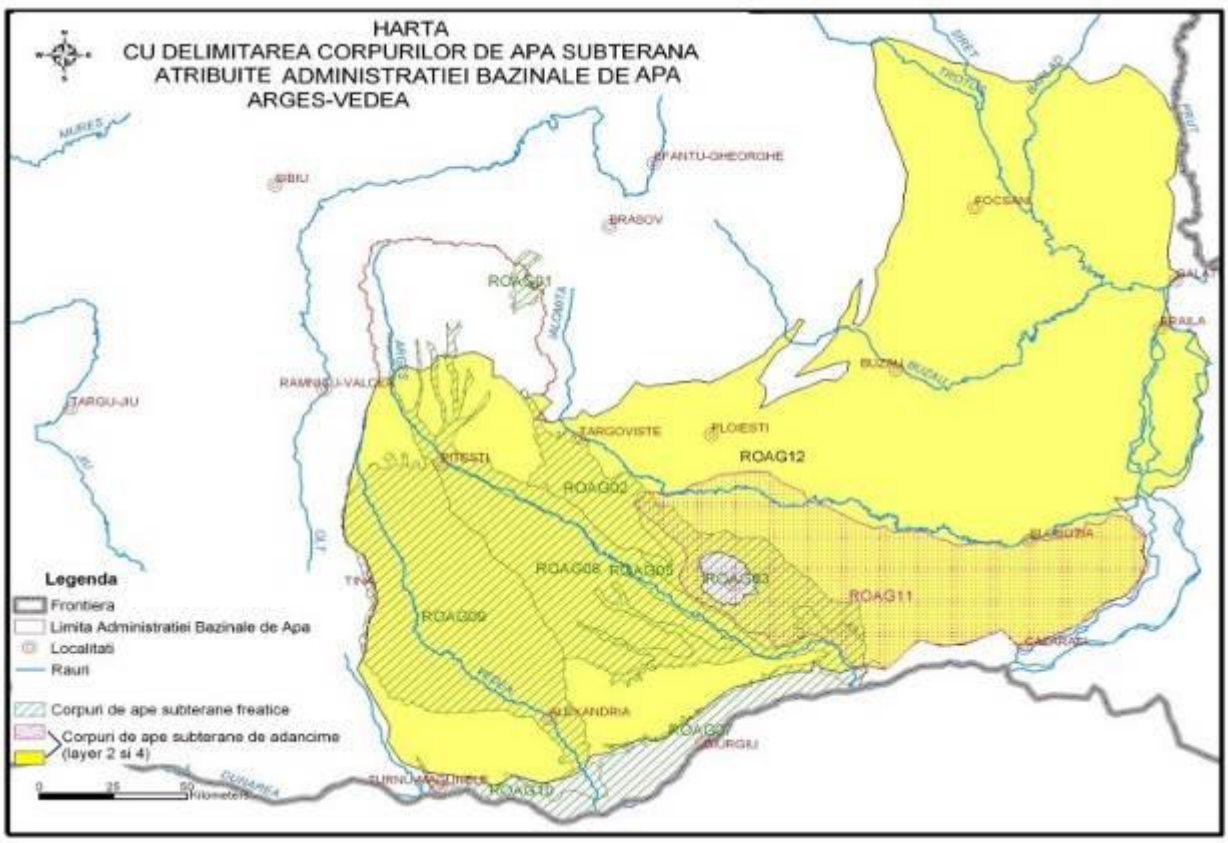


Figure no. 20 - Delimitation of groundwater bodies assigned to the Argeș-Vedea Water Basin Administration

The project area partially or entirely overlaps with the water bodies *ROAG03 - Colentina, ROAG05 Argeș river meadow and terraces* and *ROAG07 - Danube meadow on the Giurgiu-Oltenița sector*.

4.1.3.1 ROAG03 Colentina

The phreatic groundwater body is of a porous-permeable type and is located in Upper Pleistocene deposits (Colentina Gravels).

The phreatic aquifer hosted in gravels and sands develops within the interfluve of the Argeş-Dâmboviţa-Sabar-Pasărea rivers (Figure 21).

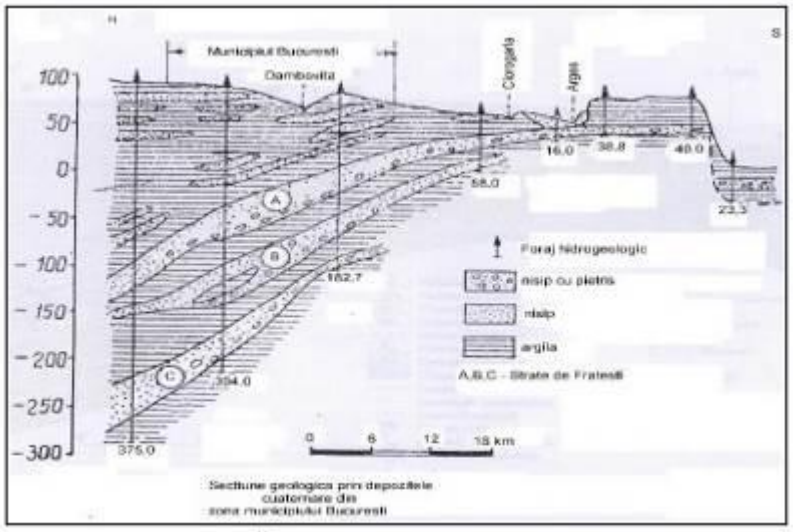


Figure no. 21 - Geological section through the Quaternary deposits in the Bucharest area

As one moves northward, a reduction in the gravel and sand layer is observed, such that north of the

Otopeni-Ștefănești-Afumați line, this horizon can no longer be identified.

The superficial deposits gradually transition into a fine, reddish-brown sand, and then into a reddish sand containing numerous organic remains. At greater depths, the grain size of the sands increases, generally becoming gravels. The entire aquifer horizon exhibits a lenticular sedimentation pattern, with lens dimensions increasing towards the aquifer bed, regardless of whether the material consists of fine sand or coarse gravel. This indicates that the basal gravels were deposited under torrential flow conditions.

The Colentina Gravels are interbedded within loess-like deposits and represent the old alluvium of the Argeș River.

According to borehole data from this aquifer horizon, on the right bank of the Dâmbovița River, the clay layer covering the sands and gravels is discontinuous and persists locally in the form of lenses.

Along a NW-SE axis passing through the centre of Bucharest, this horizon exhibits a slight inclination, with the aquifer bed descending from an elevation of 42 meters in the northwest of the capital to 32 meters in the east-southeast sector. The transmissivity zonation for the aquifer accumulated in the Colentina Gravels is presented in Figure 22.

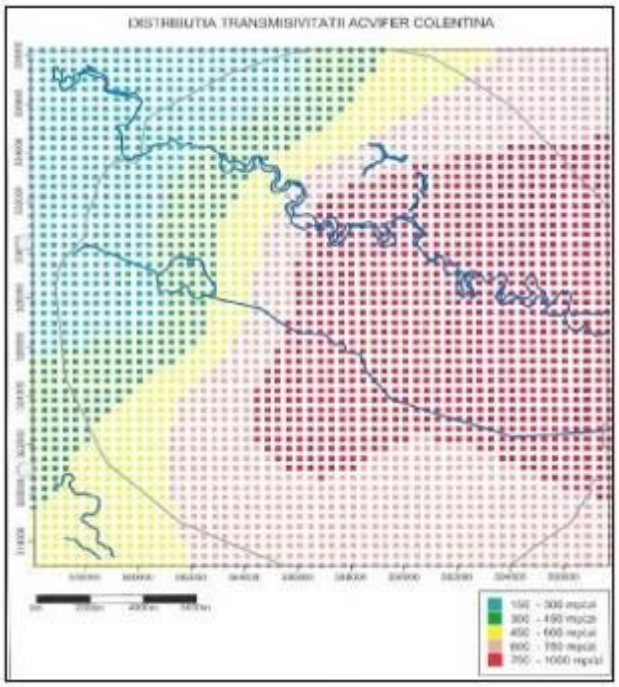
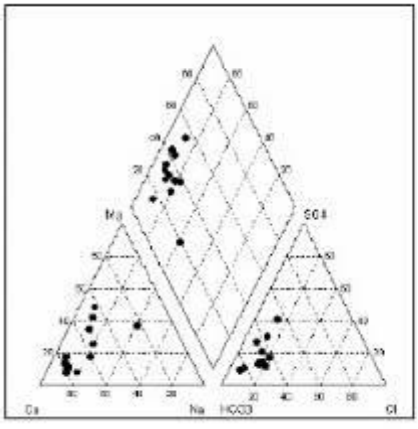


Figure no. 22 - Transmissivity zonation for the Colentina aquifer

The Piper and Schoeller diagrams (Figure 23), based on chemical analyses of monitoring well samples, highlight the calcium-magnesium bicarbonate character of the groundwater and the relatively limited variation in water chemistry.



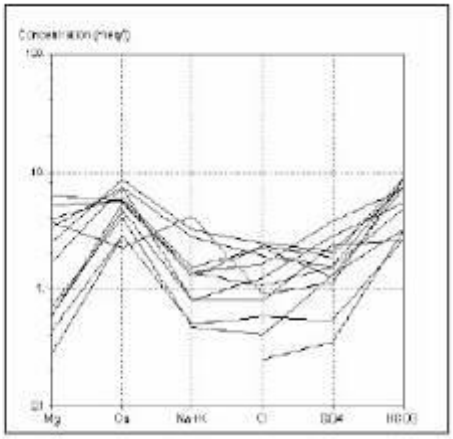


Figure no. 23 Piper and Schoeller diagrams based on water chemistry tests of some observation boreholes

From the analysis of the land use map (Figure 24), it is observed that most of this groundwater body's surface is occupied by cultivated lands.

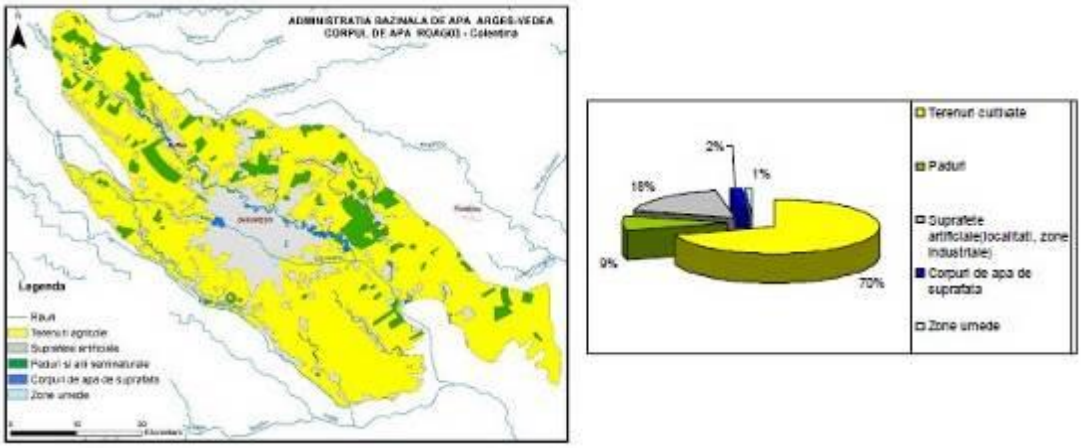


Figure no. 24 - Land use for groundwater body ROPR03-Colentina

The application of intensive agriculture on this land could have a negative impact on the qualitative status of the groundwater body. The sources of pollution identified in the Bucharest area are point source pollution caused by industrial establishments (chemical processing in Jilava and Chitila; food industry - Dragomirești Vale, Popești Leordeni, Otopeni, Ciorogârla, Bragadiru; construction - Popești Leordeni and Berceni), human settlements, which do not have wastewater collection systems, as well as diffuse pollution caused by agricultural activities (livestock - Crevedia).

The largest volumes of groundwater are extracted from water body ROAG03 - Colentina (representing 3.11 %). At higher depths, the largest volumes (79.76%) are exploited from the ROAG12 water body managed by the Argeș-Vedea Water Basin Administration, which also extends to the southern part of the Siret and Prut Water Basin Administration, as well as the Buzău-Ialomița Water Basin Administration.

Two sites of Community importance are located on the surface of the ROAG03 phreatic groundwater body, one of which covers an area of less than 10 km^2: ROSCI0343 - Forests of Mostiștei Silvosteppe with an area of 5.84 km^2. The site ROSCI0308 - Cernica Lake and Forest with an area of 32.67 km^2 was analysed. On ROSCI0308 - Cernica Lake and Cernica Forest there are 3 groundwater-dependent habitats: 91FO - Mixed forests with Quercus robur, Ulmus laevis, Fraxinus excelsior or Fraxinus angustifolia, riparian to large rivers (Ulmenion minaris), 91MO - Pannonian-Balkan Turkish oak forests, 91IO - Eurosiberian silvosteppe vegetation with Quercus spp.

The types of land use found on the ROSCI0308 site are: 231 - Cath grassland, 311 - Deciduous forests, 321 - Natural grassland and 313 - Mixed forests. The groundwater dependency level of site ROSCI0344 is classified as Type A (probable dependency).

4.1.3.2 *ROAG05 Argeș river meadow and terraces*

There are 7 sites of Community importance, five of which are smaller than 10 km^2: ROSCI0138 - Bolintin Forest with an area of 0,88 km^2, ROSCI0258 - Brătiei and Brătioarei Valleys with an area of 0,23 km^2, ROSCI0344 - Forests in the South of Cândești Piedmont with an area of 0,51 km^2, ROSCI0316 - Doamnei River Meadow with an area of 0,42 km^2, ROSCI0326 - Muscelele Argeşului with an area of 9,43 km^2. The sites ROSCI0106 - Argeș River Middle Meadow with an area of 31.16 Km^2 and ROSCI0043 - Comana with an area of 92.75 Km^2 were analysed. On ROSCI0106 - Argeș River Middle Meadow there are 2 groundwater-dependent habitats: 91FO - Mixed forests with *Quercus robur, Ulmus laevis, Fraxinus excelsior* or *Fraxinus angustifolia*, riparian to large rivers *(Ulmenion minaris*), 91MO - Pannonian-Balkan forests of Turkish oak. The types of land use found on the ROSCI0106 site are: 231 - Secondary grassland, 311 - Deciduous forests, 324 - Shrubland transition areas (mostly cleared) and 331 - Beaches, dunes, bars. The groundwater dependency level

of site ROSCI0106 is classified as Type A (probable dependency). On site ROSCI0043 - Comana there are 5 groundwater-dependant habitats: 91FO - Mixed forests with *Quercus robur, Ulmus laevis, Fraxinus excelsior* or *Fraxinus angustifolia*, riparian to large rivers *(Ulmenion minaris)*, 91MO - Pannonian-Balkan forests of Turkish oak, 91IO - Eurosiberian silvosteppe vegetation with Quercus spp, 1530 - Pannonian salt-saturated steppes and marshes, 6430 - Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels. The types of land use found on the ROSCI0043 site are: 231 - Secondary grassland, 311 - Deciduous forests, 324 - Shrubland transition areas (mostly cleared) and 321 - Natural grassland. The groundwater dependency level of site ROSCI0043 is classified as Type A (probable dependency).

4.1.3.3 ROAG07 - Danube Meadow on the Giurgiu-Oltenița sector

Two sites of community importance with areas of more than 10 km2 are developed here: ROSCI0088 - Gura Vedei - Șaica - Slobozia with an area of 81.67 Km^2 and ROSCI0043 - Comana with an area of 16.76 Km^2. On ROSCI0088 - Gura Vedei - Șaica - Slobozia there are 3 groundwater-dependent habitats: 91FO - Mixed forests with *Quercus robur, Ulmus laevis, Fraxinus excelsior* or *Fraxinus angustifolia,* riparian to large rivers *(Ulmenion minaris*), 91MO - Pannonian-Balkan forests of Turkish oak and 91IO - Eurosiberian forest-silvosteppe vegetation with Quercus spp. The types of land use found on the ROSCI0308 site are: 231 - Secondary grassland, 311 - Deciduous forests, 324 - Shrubland transition areas (mostly cleared) and 331 - Beaches, dunes, bars. The groundwater dependency level of site ROSCI0088 is classified as Type A (probable dependency). On site ROSCI0043 - Comana there are 3 groundwater-dependant habitats: 91FO - Mixed forests with *Quercus robur, Ulmus laevis, Fraxinus excelsior or Fraxinus angustifolia*, riparian to large rivers (*Ulmenion minaris*), 91MO - Pannonian-Balkan Turkish oak forests, 91IO - Eurosiberian silvosteppe vegetation with Quercus spp. The types of land use found on the ROSCI0043 site are: 231 - Secondary grasslands, 311 - Deciduous forests. The groundwater dependency level of site ROSCI0043 is classified as Type A (probable dependency).

4.1.4. Hydrogeology of the area

4.1.4.1 Argeș river

Hydrographically, the main watercourse in the area is the Argeș River. It has two main tributaries, the Neajlov River (on the right) and the Dâmbovița River (on the left).

The high permeability of the formations favours the storage of large amounts of groundwater.

Thus, towards the areas neighbouring the Danube terraces, the discharges vary around 10 l/sec, while towards the interior of the Romanian Plain, the discharges drop below 3 l/sec.

The direction of groundwater flow in the above-mentioned collectors (formations) is NW-SE.

4.1.4.2 Dâmbovița River

From a hydrogeological standpoint, the area is located within the major unit known as the Wallachian Depression, a basin that encompasses three distinct hydrostructural units: deep aquifers, intermediate-depth aquifers, and shallow aquifers

a) Deep aquifers are localised in the Frăteşti strata. The Frățești strata are composed of three complexes A, B and C (sands and gravels, separated by clay horizons).

b) The intermediate-depth aquifers are hosted in the "marl complex" and the "Mostiștea sands." The "Mostiștea sands" include two horizons of slightly clayey sands, separated in some areas by clayey interlayers. The "marl complex" has highly variable thicknesses and consists of clays and marly clays with lenticular interlayers of sands (sometimes dusty).

c) The shallow aquifer is located at depths of 2-5 m in the floodplain area, 5-8 m on the lower terrace, and 12-20 m on the high plain.

4.1.5. Groundwater quality

The impact of anthropogenic pressures on groundwater bodies was assessed on the basis of groundwater body characterisation data, on the basis of the results obtained from quantitative and qualitative (chemical) groundwater body monitoring and on the basis of the results obtained from the 2013 water body condition assessment process.

Significant impact was considered for those water bodies with a poor chemical and quantitative status, and impact types such as nutrient pollution, chemical pollution, saline intrusion, over-exploitation of the resource, etc. were considered.

A significant qualitative impact on groundwater can have the following types of pollution caused by:

- point-source pollution from non-compliant landfills;
- diffuse pollution caused by agricultural activities (agricultural holdings without proper manure storage systems, non-compliant fertiliser storage, etc.);
- wastewater (domestic, industrial, etc.) discharged into water resources without proper treatment;
- other potentially polluting anthropogenic activities.

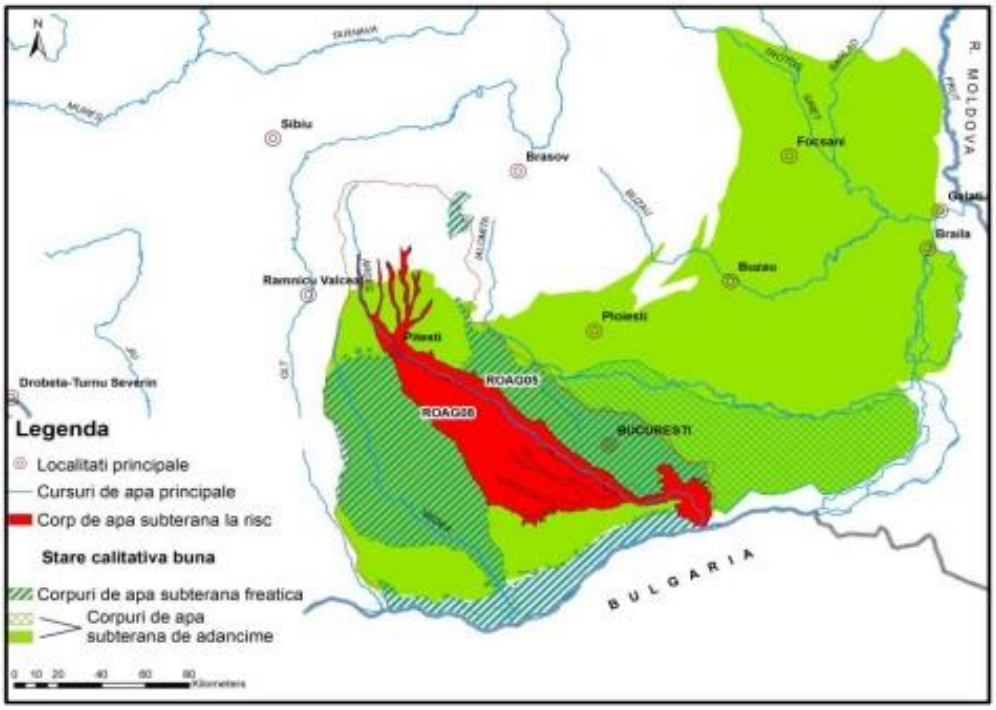


Figure no. 25 - Groundwater body at chemical risk on the territory of Argeș - Vedea Water Basin Administration

Following the analysis conducted on the water body ROAG03, it was considered as being at risk of not achieving good chemical status. In the second Basin Management Plan, the water body has reached good quality status, which means that the measures proposed and adopted have taken effect. This is also shown by the trend assessment where a decreasing trend for nitrate is observed for water body ROAG03 (Fig. 25).

For the water body ROAG05 a degradation of the qualitative status was observed. The main sources of pollution identified were non-point pollution from agriculture (animal husbandry, anthropogenic polluting activities, etc.), as well as human settlements without wastewater collection systems (Fig. 26).

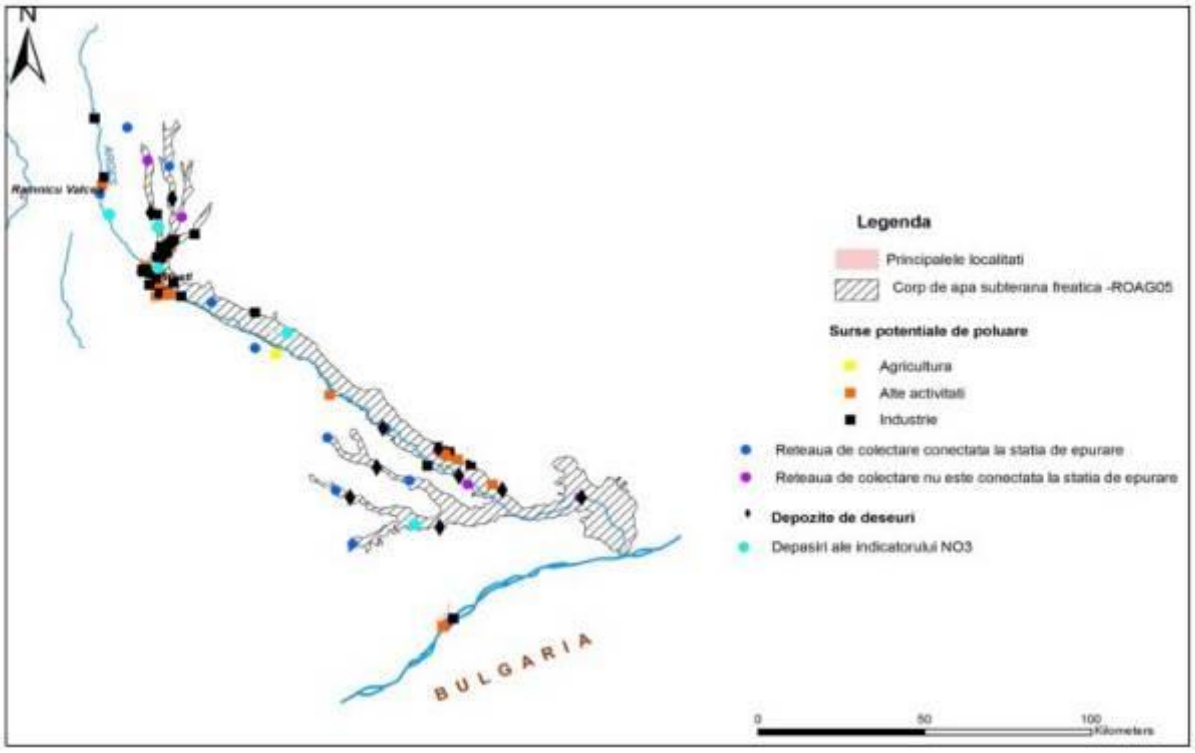


Figure no. 26 - Location of pollution sources and monitoring boreholes exceeding NO_3 levels for groundwater body ROAG05

4.1.6. Surface and groundwater abstraction/use

On the territory administered by Argeș-Vedea WBA there are 669 abstractions (Figure 27) consisting of single boreholes/abstraction zones, springs; to these are added 394 abstractions administered by Buzău - Ialomița WBA, 47 abstractions administered by Prut-Bârlad WBA and 87 abstractions administered by Siret WBA, which exploits the ROAG12 groundwater body belonging to Argeș-Vedea WBA. The largest volumes of groundwater are extracted from water body ROAG03 - Colentina (representing 3.11 %). At higher depths, the largest volumes (79.76%) are exploited from the ROAG12 water body managed by the Argeș-Vedea Water Basin Administration, which also extends to the southern part of the Siret and Prut Water Basin Administration, as well as the Buzău-Ialomița Water Basin Administration.

The largest volumes of groundwater are extracted from water body ROAG03 - Colentina (representing 3.11 %). At higher depths, the largest volumes (79.76%) are exploited from the ROAG12 water body managed by the Argeș-Vedea WBA, which also extends to the southern part of the Siret and Prut Water Basin Administration, as well as the Buzău-Ialomița WBA (Fig. 27).

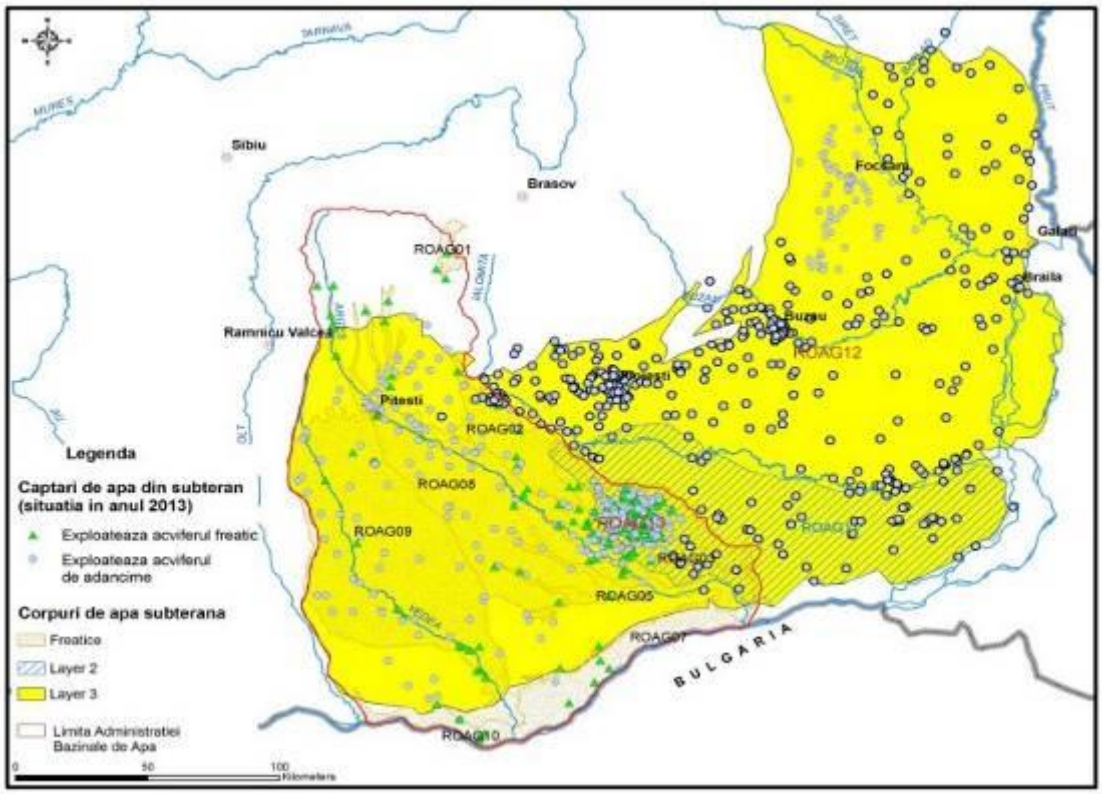


Figure no. 27 - Groundwater abstractions related to Argeș-Vedea WBA

The graphical representation of all abstractions is shown in the figure below. The volumes abstracted from each individual groundwater body are evaluated (on a per cent basis) (Fig 28).

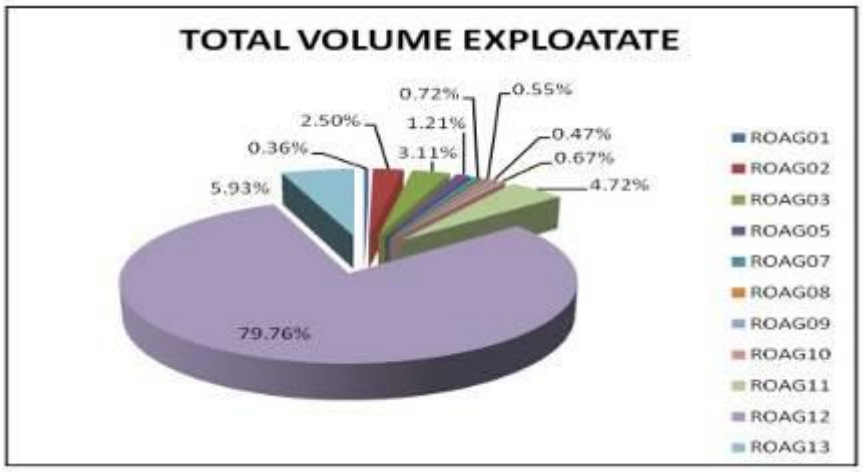


Figure no. 28 - Graphical representation of water abstractions within Argeș-Vedea WBA

Most of the water abstracted from water bodies related to the Argeș Vedea WBA is used for supplying water to the population (63554.97 million cubic metres/year), followed by industry (42347.95 million cubic metres/year) and lastly agriculture (5452.51 million cubic metres/year). The volumes abstracted from each groundwater body (of interest in the project area), as well as the calculated resource, are shown in the table below.

Groundwater body	***Population supply (million cubic metres/year)***	***Industry (million cubic metres/year)***	***Agriculture (million cubic metres/year)***
ROAG03	999.11	2009.77	456.30
ROAG05	940.24	363.36	47.44
ROAG07	377.33	392.74	29.12

Of the total number of abstractions, only one significant groundwater exploitation was identified, namely SC APA SERV SA ALEXANDRIA Front Orbeasca-Lăceni (3650 thousand cubic metres/year), which exploits the ROAG12 water body.

The downward trend in the volumes of groundwater abstracted in recent years can be attributed to the following causes:

- the reduction of some industrial units;
- non-full utilisation of the abstraction capacity of the catchment fronts (both in some economic operators and in the city distribution network);
- the "ageing" of some boreholes.

Recharge of aquifers in the Argeș - Vedea catchment area is realised by infiltration of surface and meteoric waters.

With regard to the abstraction/recharge balance, which leads to the assessment of the groundwater body in terms of quantity, no particular problems are reported, with abstractions being lower than the natural recharge rate.

The analysis shows that out of the total number of 214 quantitative monitoring points in 2013, about 74 % of the boreholes show decreases in the mean hydrostatic level compared to the multiannual mean hydrostatic level (as can be seen in Figure 29).

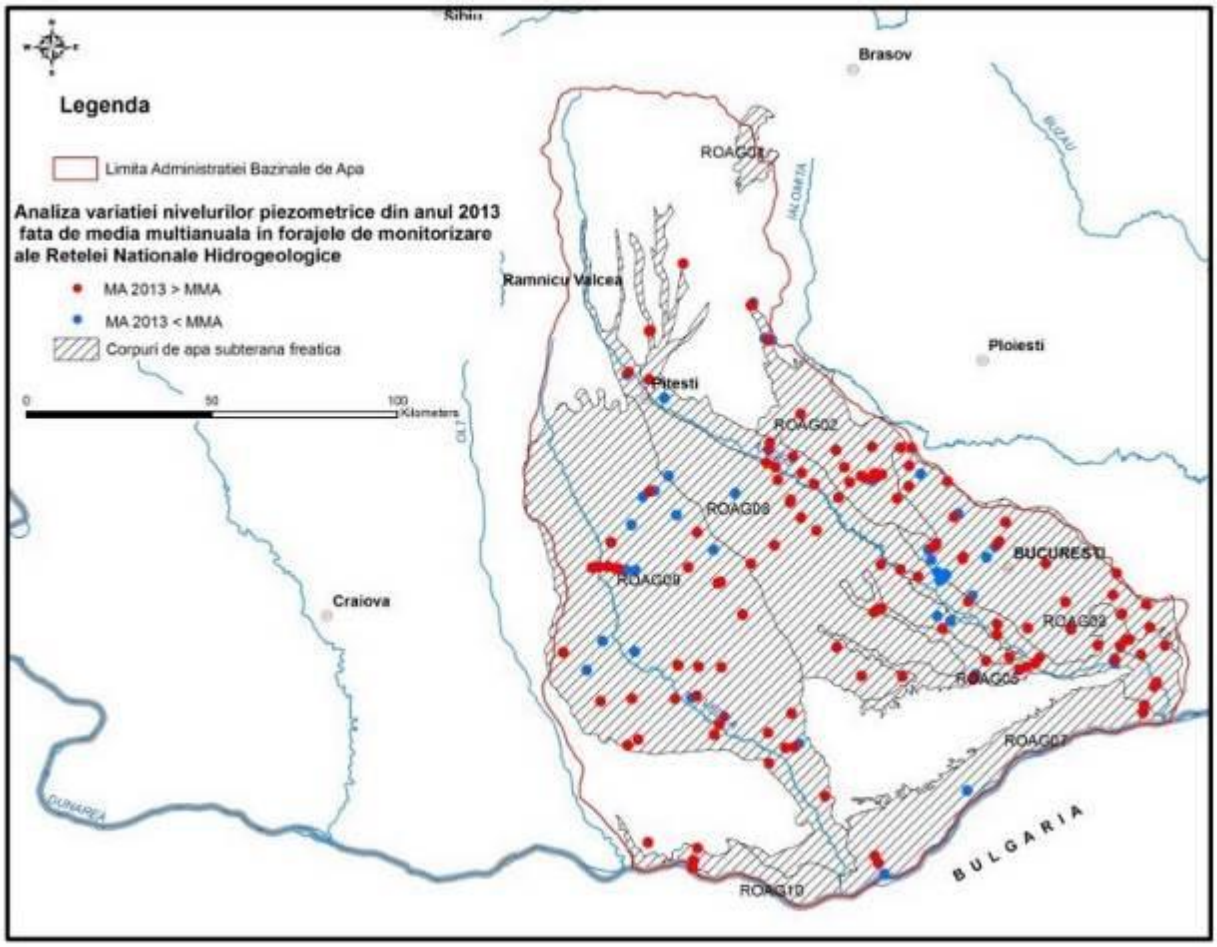


Figure no. 29 - Analysis of the evolution of hydrostatic levels in the quantitative monitoring boreholes of Argeș-Vedea WBA

These decreases are due to lack of rainfall and not the impact of human activities (overexploitation). A more noticeable decrease is observed in second-order boreholes located in interfluves, but also in some boreholes located in river valleys, where the recharge is mixed (both precipitation and seepage from the river).

Following the evolution of these multi-annual hydrostatic levels compared to the annual average, for each groundwater body of interest for the project, the following can be observed:

- in the case of water body ROAG03, in more than half of the boreholes with quantitative monitoring, decreases in the annual average levels per year compared to the multiannual average level are observed (Fig. 30)

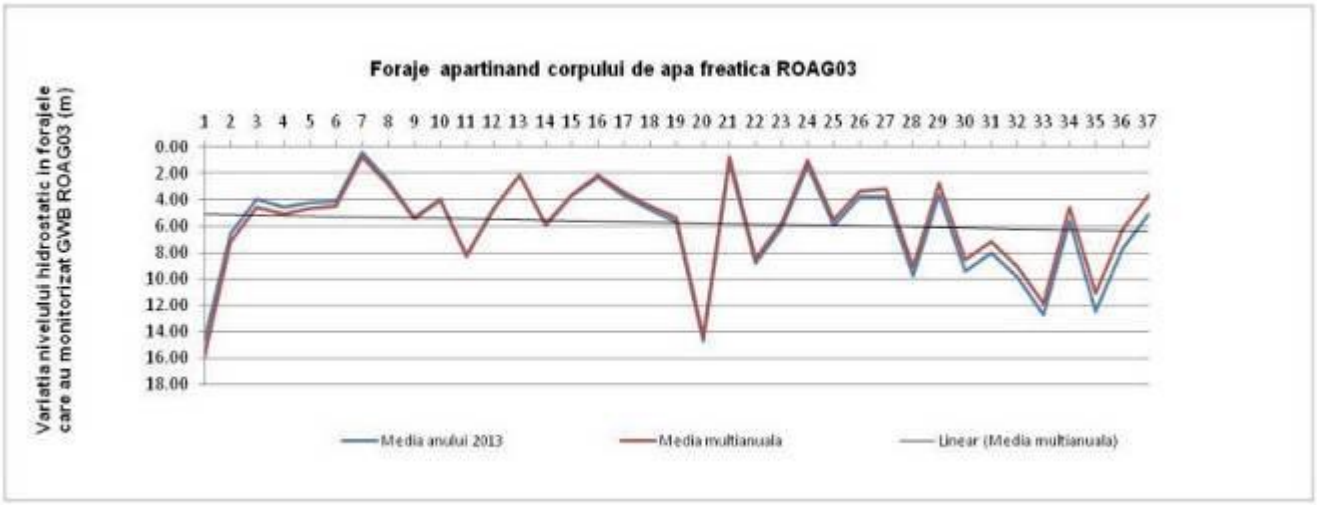


Figure no. 30 - Multiannual hydrostatic level evolution and annual average for the water body ROAG03

- For the water body ROAG05 monitored quantitatively, decreases in the annual average levels are observed per year compared to the multiannual average level in most boreholes (Fig. 31).

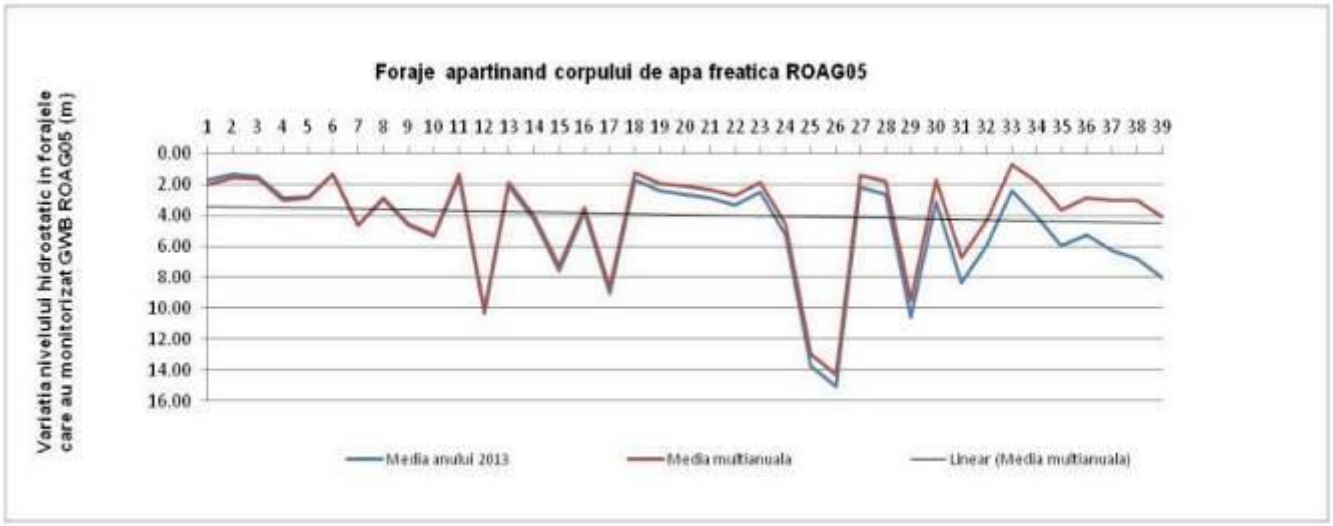


Figure no. 31 - Multiannual hydrostatic level evolution and annual average for the water body ROAG05

- In some of the quantitative monitoring points of the water body ROAG07 there are decreases in the annual average levels per year compared to the multiannual average level in most boreholes.

From the analysis performed, it results that none of the 11 groundwater bodies delimited on the territory of Argeș - Vedea WBA has reached a poor quantitative status (as shown in Figure 32). The average hydrostatic level is decreasing compared to the multiannual average level in all the quantity monitoring points on the territory of Argeș-Vedea WBA. These decreases are not due to the impact of human activities (overexploitation), but to reduced rainfall.

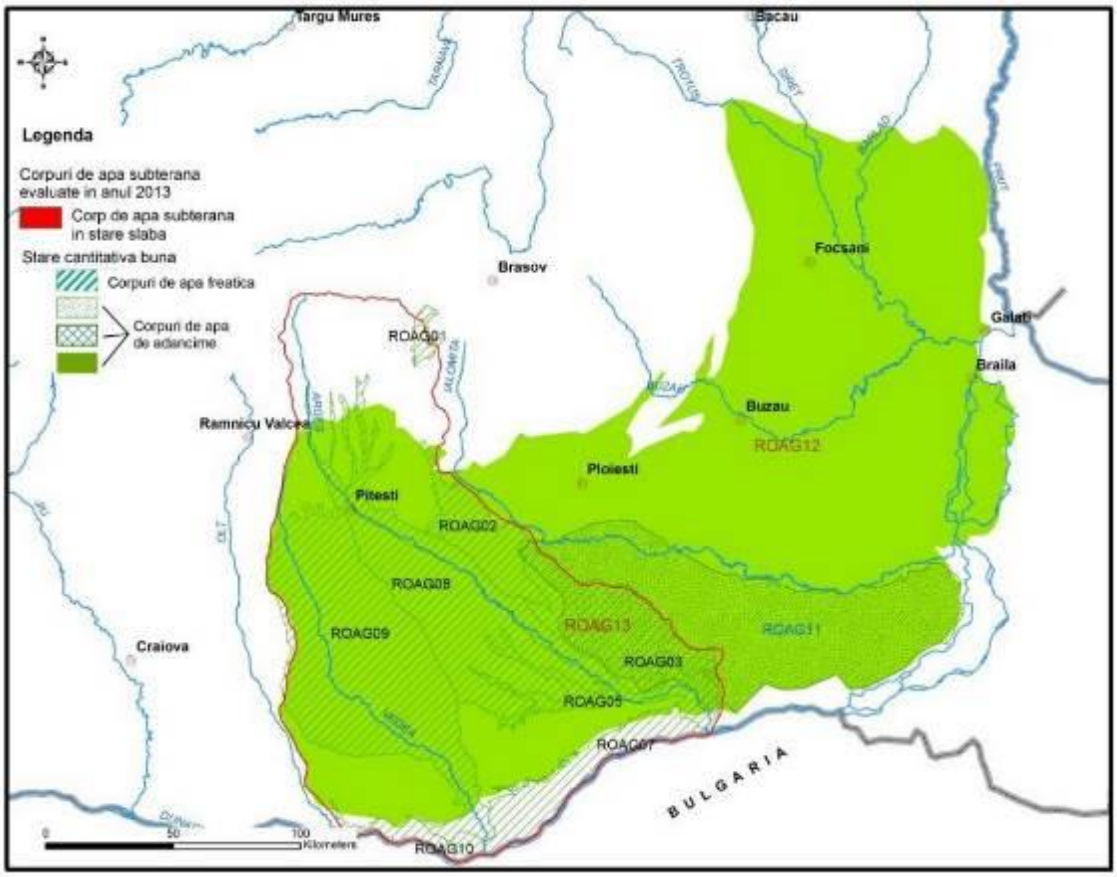


Figure no. 32 - Quantitative status of groundwater bodies attributed to Argeș-Vedea WBA

In terms of water quality, the water quality status for each of the three groundwater bodies of interest for the project is presented below:

- ✓ ***Groundwater body ROAG03 - Colentina***

The quality of groundwater contained in *ROAG03 - Colentina* was determined on the basis of samples taken from monitoring boreholes. The analysis showed exceedances of the quality standard for nitrates, phosphates and chlorides at a small number of monitoring points. The analysis has shown that the chemical status of this groundwater body is *good* due to the fact that the nitrate-polluted surface (identified using the IDW interpolation method) occupies 11.46% of the groundwater body surface.

- ✓ ***Groundwater body ROAG05 - Argeș river meadow and terraces***

The groundwater body *ROAG05 - Argeș river meadow and terraces* was assessed in terms of water quality, based on samples from monitoring boreholes belonging to the National Hydrogeological Network. The analysis revealed exceedances for the following indicators: ammonium, nitrates, phosphates and chlorine. Considering the exceedance proportion of nitrate-polluted surfaces (22.25 % of the entire groundwater body surface area), we consider this water body to be in poor chemical status. By using the IDW (Inverse Distance Weighted) interpolation method, the areas with nitrogen exceedances, outlined in red (b), in the surface of the groundwater body *ROAG05 - Argeș river meadow and terraces* are obtained. During the preparation of the second Basin Management Plan, the methodology for the assessment of the qualitative status was modified with a view to quantifying the areas occupied by boreholes with exceedances over the entire surface of the groundwater body. These areas were calculated using the IDW interpolation method.

- ✓ ***Groundwater body ROAG07 - Danube Meadow (Giurgiu - Oltenița)***

The groundwater quality of the water body *ROAG07- Danube Meadow (Giurgiu - Oltenița)* was

monitored by boreholes of the National Hydrogeological Network. None of the parameters analysed were found to be exceeded. Consequently, based on the analyses carried out, this water body is in good chemical status.

4.1.7. Hydrological and morphological characterisation of the site

4.1.7.1 Argeș river

The Argeș catchment area is located in the southern part of the country, with a surface area of 12550 km^2, of which the Lower Argeș upstream of Neajlov occupies 8480 km^2.

The coded river network of the catchment has an average density of 0.36 km/km^2, varying from 0.67 km/km^2 in the upper zone to 0.507 km/km^2 in the middle zone and up to 0.3 km/km^2 in the lower zone.

The main hydro-morphological characteristics of the surveyed watercourses located in the areas of the route of the river control works are:

- ***Argeș River, section upstream of the confluence with Neajlov River***
  - catchment area 4080 km^2
  - river length 283 km
  - designed thalweg elevation on the middle section 43 mdM
  - mean altitude of the catchment area 714 mdM
  - maximum altitude of the catchment area 2140 mdM
  - average slope of the river 0.7%
  - sinuosity index 1.47
- ***Argeș river, section upstream of the confluence with Dâmbovița river***
  - catchment area 10350 km^2
  - river length 313 km
  - designed thalweg elevation on the middle section 27 mdM
  - mean altitude of the catchment area 392 mdM
  - maximum altitude of the catchment area 2140 mdM
  - average slope of the river 0.7%
  - sinuosity index 1.49
- ***Argeș river, section upstream of Danube river***
  - catchment area 12550 km^2
  - river length 350 km
  - designed thalweg elevation on the middle section 12 mdM
  - mean altitude of the catchment area 379 mdM
  - maximum altitude of the catchment area 2140 mdM
  - average slope of the river 0.6%
  - sinuosity index 1.52
- ***Neajlov River, section upstream of the confluence with Argeș river***
  - catchment area 3720 km^2
  - river length 186 km
  - designed thalweg elevation on the middle section 43 mdM
  - mean altitude of the catchment area 129 mdM
  - maximum altitude of the catchment area 315 mdM
  - average slope of the river 0.2%
  - sinuosity index 1.47
- ***Sabar river, section upstream of the confluence with Argeș river***
  - catchment area 1346 km^2 (natural rate)
  - river length 174 km
  - designed thalweg elevation on the middle section 37 mdM

- mean altitude of the catchment area 175 mdM
- maximum altitude of the catchment area 349 mdM
- average slope of the river 0.2%
- sinuosity index 1.49.

Morphological data

The Argeș hydrographic area includes all landforms, descending from north to south: mountains (10.4% only in the Argeș catchment area), hills and platforms (19.9%) and plains (69.70%), with altitudes ranging between 2544 m (Moldoveanu Peak in Făgăraș Mountains) and about 15 m at the discharge of Argeș river into the Danube, plus the Danube Meadow.

At the northern limit of the hydrographical area are the mountains arranged in two parallel rows: mountains over 2000 m high (Făgăraș, Iezer - Păpușa, Piatra Craiului) and the row of medium mountains (Frunții, Ghițu, Zănoaga, Leaota). The Subcarpathian hilly area is formed by two parallel rows: the range of the elongated ridges with heights of 900 -1200 m (Goisu - Chicera, Poienarei, Platica, Mataul) and the rows of the hills (600 -900 m).

The area of platforms with heights of 200 - 600 m (Cotmeana Argeșului and Candești) and then the plain area: high (Piteștiului and Târgogoviștei Plain), middle (Boianu, Găvanu - Burdea), subsidence (Titu - Răcari between Neajlov and Colentina) and low plains (Burnaz, Câlnăului, Mostiștei).

Being an integral part of the Romanian Plain, the territory of Giurgiu county includes the Vlăsiei Plain in the north, Burnaz in the south-west, a high field with a tubular aspect with uneven edges, and in the south the Danube Meadow. The maximum altitude is 136 m recorded in the north of the county (Cartojan village) and the minimum altitude is 12 m in the Danube Meadow.

4.1.7.2 Dâmbovița River

The Dâmbovița River is part of the Argeș catchment area, springs from the Făgăraș Mountains, is a left tributary of the Argeș River and flows into the Argeș River in the Budești area. It is 286 km long and has a catchment area of 2824 km^2.

The Dâmbovița River enters the Ilfov County near Dragomirești Vale and after crossing the municipality of Bucharest (over a distance of 22 km) after a general flow direction NW - SE, it leaves the city upstream of the confluence with the Colentina River.

When passing through Bucharest, the river was dammed to form the Morii Lake. Downstream of this lake, the river has been channelled along the entire stretch of the riverbed that runs through the capital. Downstream from Bucharest, the Dâmbovița has the Colentina River as its tributary.

The main hydro-morphological characteristics of the surveyed watercourses located in the areas of the studied the river control works are presented below.

- ***Dâmbovița river, upstream of the confluence with Colentina river***
  - catchment area 1581 km^2
  - river length 258 km
  - mean altitude of the catchment area 159 mdM
  - average slope of the river 7%
  - sinuosity index 1.17
- ***Dâmbovița river, upstream of the confluence with Pasarea river***
  - catchment area 926 km^2
  - river length 266 km
  - mean altitude of the catchment area 485 mdM
  - average slope of the river 7%
  - sinuosity index 1.58
- ***Dâmbovița river, upstream of the confluence with Calnau river***
  - catchment area 1293 km^2

- river length 279 km
- mean altitude of the catchment area 4259 mdM
- average slope of the river 6%
- sinuosity index 1.53.

Morphological data

The Argeș catchment area, of which the Dâmbovița river is part, encompasses all landforms, descending from north to south: mountains (10.4% only in the Argeș river basin area), hills and platforms (19.9%) and plains (69.70%), with altitudes ranging from 2544 m (Vf. Moldoveanu in the Făgăraș Mountains) and about 15 metres at the mouth of the Argeș river into the Danube, plus the Danube Meadow.

At the northern limit of the hydrographical area are the mountains arranged in two parallel rows: mountains over 2000 m high (Făgăraș, Iezer - Păpușa, Piatra Craiului) and the row of medium mountains (Frunții, Ghițu, Zănoaga, Leaota). The Subcarpathian hilly area is formed by two parallel rows: the range of the elongated ridges with heights of 900 -1200 m (Goisu - Chicerea, Poienarei, Platica, Mataul) and the rows of the hills (600 -900 m).

The area of platforms with heights of 200 - -600 m (Cormeana Argeșului and Candești) and then the plain area: high (Piteștiului and Târgogoviștei Plain), middle (Boianu, Găvanu - Burdea), subsidence (Titu - Răcari between Neajlov and Colentina) and low plains (Burnaz, Câlnăului, Mostiștei).

Being an integral part of the Romanian Plain, the territory of Giurgiu county includes the Vlăsiei Plain in the north, Burnaz in the south-west, a high field with a tubular aspect with uneven edges, and in the south the Danube Meadow. The maximum altitude is 136 m recorded in the north of the county (Catojani village) and the minimum altitude is 12 m in the Danube Meadow.

4.1.8. Site analysis in terms of floods

The reference area of the project corresponds to the Argeș River, the Dâmbovița River and the Danube River, while in the project area the responsibility lies with the Argeș - Vedea Water Basin Administration.

According to the *Flood Management Plan on Argeș - Vedea river basin*, torrential rains produce particularly high flows, while in sub-basins with larger areas, the effect of torrential rains decreases significantly, and the determining role in the formation of maximum flows is played by long-lasting rainfall or melting snow over a rainy period.

The floods on the Argeș river independently cause damages on the upper course, but starting from Găești downstream, the floods they cause overlap, in case of coincidence, with those on the Săbar river (having a common meadow of over 120 km).

In this regard, we recall the large floods with simultaneous flooding on the Argeș and Săbar rivers recorded as follows:

- 5-20 October 1972 with p = 4% on Săbar river (Poenari catchment area);
- 2-6 July 1975 with p = 4% on Săbar river (Poenari catchment area);
- 22-26 June 1979 with p = 0.5% on Săbar river (Poenari catchment area).

Analysing the effects of the 1975 and 1979 floods in Argeș river basin, it has been found that the 1975 flood (generated by a uniform rainfall over the basin) is the most important one, totalling 50,850 ha flooded on the Argeș and Sabar rivers.

On the Neajlov River the most important damages were recorded (except for the historical flood of 1941) during the flood of 1972 when 1,700 households, 12,500 ha of agricultural land and approx. 60 km of roads were affected.

In the following Table 16, for the Argeș - Vedea catchment area, a history of flood events is presented, which served as a basis for analysing the identification of significant flood events as part of the preliminary flood risk assessment.

Table no. 16 - Flood history in Argeș - Vedea catchment area

Unitate de management	Nume eveniment	Data producerii	Durată (zile)
Administrația Bazinală de Apă Argeș - Vedea	Argeș iulie 1970	05.07.1970	3
	Râul Doamnei iulie 1970	05.07.1970	2
	Râul Targului 1970	05.07.1970	1
	Neajlov iulie 1970	08.07.1970	15
	Dâmbovnic iulie 1970	05.07.1970	2
	Glavacioc iulie 1970	08.07.1970	10
	Săbar iulie 1970	08.07.1970	10
	Dâmbovița iulie 1970	07.07.1970	3
	Colentina iulie 1970	08.07.1970	21
	Vedea iulie 1970	05.07.1970	2
	Cotmeana iulie 1970	08.07.1970	1
	Teleorman iulie 1970	05.07.1970	22
	Argeș iulie 1972	07.1972	14
	Râul Doamnei iulie 1972	07.1972	3
	Neajlov iulie 1972	07.1972	10
	Dâmbovnic iulie 1972	07.1972	8
	Câlnișlea iulie 1972	07.1972	14
	Glavacioc iulie 1972	07.1972	10
	Săbar iulie 1972	07.1972	14
	Dâmbovița iulie 1972	07.1972	9
	Colentina iulie 1972	07.1972	6
	Argeș iulie 1975	02.07.1975	4
	Râul Doamnei iulie 1975	02.07.1975	4
	Râul Târgului iulie 1975	02.07.1975	4
	Neajlov iulie 1975	02.07.1975	4
	Dâmbovnic iulie 1975	03.07.1975	4
	Câlnișlea iulie 1975	03.07.1975	4
	Glavacioc iulie 1975	03.07.1975	4
	Săbar iulie 1975	03.07.1975	4
	Dâmbovița iulie 1975	03.07.1975	4
	Colentina iulie 1975	03.07.1975	4
	Vedea iulie 1975	02.07.1975	4
	Pârâul Câinelui iulie 1975	02.07.1975	4
	Teleorman iulie 1975	02.07.1975	4
	Argeș iunie 1979	.06.1979	3
	Râul Târgului iunie 1979	.06.1979	3
	Neajlov iunie 1979	.06.1979	3
	Săbar iunie 1979	.06.1979	4
	Dâmbovița iunie 1979	.06.1979	1
	Topolog iunie 1979	.06.1979	1
	Vedea iulie 2005	02.07.2005	4
	Dâmbovița septembrie 2005	20.09.2005	6
	Ciorogârla septembrie 2005	21.09.2005	6
	Neajlov septembrie 2005	19.09.2005	6
	Târgului iulie 2010	03.07.2010	1
	Vâlsan august 2010	07.08.2010	1

The flood risk management plan has also highlighted the flood risk areas for the catchment area where the project is located, and a punctual floodability study will establish for the analysed area the risks and the necessary flood protection measures for the operation period of the navigable canal, measures which are also part of the operation plan (these two studies are a recommendation for implementation for the operation period).

The table below presents the areas with significant potential flood risk in the Argeș - Vedea WBA.

Table 17 - Areas with potentially significant flood risk

Denumire zonă cu risc potențial semnificativ la inundații	Lungime (km)
r. Vedea - av. loc. Făgețelu	212,0
r. Vediţa - av. loc. Bărăștii de Vede	26,8
r. Plapcea - av. loc. Constantineşti	37,3
r. Cotmeana - av. loc. Săpata	53,8
r. Dorofei - av. loc. Bacea	23,4
r. Tecuci - av. confl. Bălăcel	24,0
r. Burdea - av. loc. Burdeni	76,1
r. Pârâul Câinelui - av. loc. Căldăraru	105,1
r. Tinoasa - av. loc. Ciurari	45,9
r. Teleorman - av. loc. Tătărăștii de Sus	108,7
r. Claniţa - av. loc. Scurtu-Slăveşti, am. ac. Băbăiţa	49,9
r. Argeș - av. loc. Pitești	229,1
r. Vâlsan - av. loc. Brădetu	44,1
r. Râul Doamnei - av. loc. Sboghiţeşti	64,1
r. Râul Târgului - av. loc. Pojorâta	53,8
r. Bratia - av. loc. Berevoeşti	25,8
r. Argeşel - av. loc. Muşcel	41,2
r. Cârcinov - av. confl. Valea Mare	31,8
r. Budişteanca - av. loc. Bârloi	16,6
r. Neajlov - av. loc. Moara din Groapă	108,1
r. Dâmbovnic - av. loc. Pădureni	104,6
r. Călnişţea - av. ac. Călnişţea	85,6
r. Glavacioc - av. loc. Cătunu	107,9
r. Sericu - av. loc. Siliștea Mică	26,9
r. Milcovăţ - av. loc. Coşoaia	23,0
r. Sabar - av. confl. Potop	130,6
r. Potop - av. confl. Potocel	47,2
r. Şuţa - av. loc. Gura Şuţii	38,2
r. Băi	27,3
r. Ciorogârla	58,8
r. Dâmboviţa - av. loc. Dragoslavele am. loc. Brezoaele	133,4
r. Dâmboviţa - av. loc. Dragomireşti Deal	58,4
r. Colentina - av. loc. Colacu	78,6
r. Călmăţui - av. loc. Călineşti	105,4

4.2 Air

4.2.1. Current air quality status

The project site overlaps with the counties of Ilfov, Giurgiu and Călărași.

Next, based on information from the websites of the Environmental Protection Agencies of the three counties, the environmental state in terms of air quality will be presented.

The air quality at each monitoring station is represented by suggestive air quality indices based on the concentration values of the main air pollutants measured.

Interpretation of air quality data, provided by the automatic stations of the National Air Quality Monitoring Network, is done by calculating the specific air quality index, which is a coding system of the concentrations recorded for each of the following monitored pollutants:

✓ ***Sulphur dioxide*** is a highly reactive gas from the combustion of sulphurous fossil fuels (coal, fuel oil) for the production of electricity and heat, and of liquid fuels (diesel) from internal combustion engines in road vehicles (SO_2)

✓ ***Nitrogen dioxide*** - oxides of nitrogen come from the combustion of solid, liquid and gaseous fuels in various industrial, residential, commercial, institutional and road transport installations. Nitrogen oxides have an eutrophic effect (gradual increase in nitrogen concentration) on ecosystems and an acidifying effect on many environmental components such as soil, water, terrestrial and/or aquatic ecosystems, but also corrosive effects on buildings and historical monuments (NO_2)

✓ Tropospheric ***ozone*** is a secondary pollutant, formed from precursors (NOx, volatile organic compounds - VOCs and CO). Complex photochemical chain reactions of ozone formation and destruction take place in the atmosphere, depending on meteorological conditions and the presence of precursors. Meteorological conditions favourable for ozone formation from precursors are: long and intense sunshine, clear skies, lack of precipitation, high temperatures, temperature inversions. As a result, the highest values of ozone in the lower atmosphere are usually recorded in the spring-summer seasons in the afternoon, while in the cold season the values are the lowest of the year (O_3)

✓ ***Suspended particulate matter PM10 fraction*** - suspended particulate matter in the atmosphere is a long-range pollutant that is transported over long distances, originating from natural causes such as wind blowing particles from the ground surface (the case of Saharan dust pollution at national level), fires, volcanic eruptions, etc. or from anthropogenic sources such as: combustion in the energy sector, production processes (metallurgical industry, chemical industry, etc.), construction sites, road transport, industrial and municipal landfills, residential heating systems, in particular those using solid fuels, etc. The values of particulate matter - PM10, are determined by two methods: by the automatic method - non-photometric - in automatic stations, and by the standardised method - gravimetric, in the laboratory.

4.2.1.1 Ilfov County

The air quality monitoring network in Ilfov County (Fig. 33) consists of the following monitoring stations:

- Station B7 - Măgurele, suburban station. Address: Comuna Magurele, str. Atomiştilor nr. 407, jud. Ilfov County
- Station B8 - Balotești, regional station. Address: UM 01802 - Baloteşti
- Station B10 - Chiajna, urban station. Address: str. Speranței 1 bis, Chiajna, Ilfov
- Station B11 - Bragadiru, traffic station. Address: Șos. Alexandriei nr. 249
- Station B26 - School No. 3 Voluntari, urban station. Address: Strada Erou Ion Serban Nr. 1 Voluntari
- Station B27 - Voluntari Town Hall, urban station. Address: Bulevardul Voluntari, nr. 74, Ilfov
- Station B28 - Glina, urban station. Address: Strada Libertatii nr. 292, Glina, Ilfov Otopeni
- Station B29 Otopeni, urban station. Address: Liceul Ioan Petruș, Otopeni, str. 23 Ianuarie nr. 4.



Figure no. 33 - Location of air monitoring stations in Ilfov County

Of the monitoring stations mentioned above, of interest and closest to the site area is the Glina station (B28).

According to 2023 data (the last year in which the environmental quality report was published on the website of the EPA Ilfov), only the PM10 index was monitored at the Glina station:

Station	*Pollutant*	*M.U.*	*Exceedance type*	*Monthly average*	*No of exceedances in current year*	*Monthly data capture (%)*
B28 -Glina	PM10 automatically	µg/mc	LV 24 hours	11.91	12	100

4.2.1.2 Giurgiu County

In Giurgiu County, air quality is monitored by the Giurgiu Environmental Protection Agency through 4 air quality monitoring stations, integrated in the National Air Quality Monitoring Network. The automatic monitoring stations are located, taking into account the specificity of each of them, 3 in Giurgiu municipality and one in rural areas, as follows (Fig. 34):

- GR1 - traffic station located on Bucharest Road, at the entrance to Giurgiu municipality, a location considered appropriate in terms of traffic flow. The parameters monitored are: sulphur dioxide (SO2), nitrogen oxides (NO/NOx/ NO2), carbon monoxide (CO), volatile organic compounds (VOC), particulate matter (PM10), lead (Pb).
- GR2 - urban station located in Elevilor Park, adjacent to Transilvania Street, in an area not directly exposed to local traffic and industry. The parameters monitored are: sulphur dioxide (SO2),

nitrogen oxides (NO/NOx/ NO2), carbon monoxide (CO), ozone (O3), volatile organic compounds (VOC), particulate matter (PM10), lead (Pb) and weather parameters

- GR3 - industrial station located in the courtyard of the Giurgiu Weather Station, Sloboziei road, in an industrial area that includes the thermoelectric power plant of Giurgiu municipality. The parameters monitored are: sulphur dioxide (SO2), nitrogen oxides (NO/NOx/ NO2), carbon monoxide (CO), particulate matter (PM10), lead (Pb) and meteorological parameters
- GR 4 - sub-regional rural type station located in the village of Braniștea, Oinacu commune, far away from all major pollution sources. The parameters monitored are: sulphur dioxide (SO2), nitrogen oxides (NO/NOx/ NO2), carbon monoxide (CO), ozone (O3), volatile organic compounds (VOC), particulate matter (PM2.5) and weather parameters.

Considering the location of the project, the nearest air quality monitoring station in Giurgiu County is GR4 - located in Oinacu, Braniștea village (located at a distance of about 30 km).

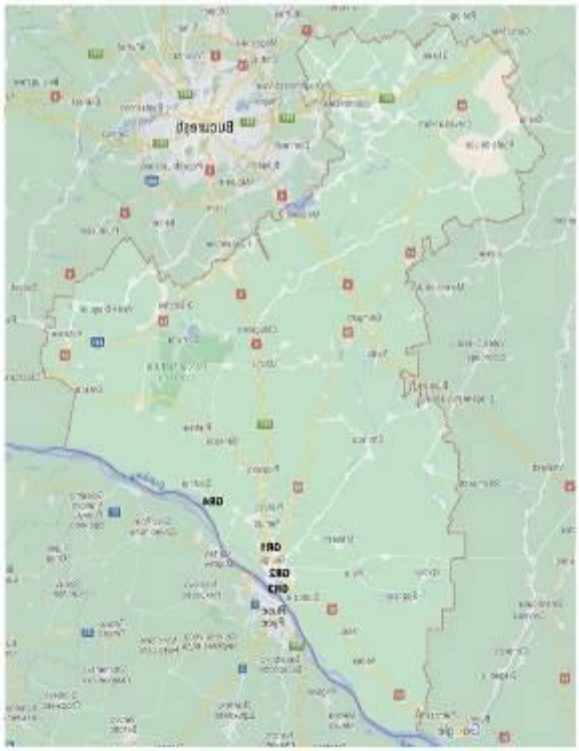


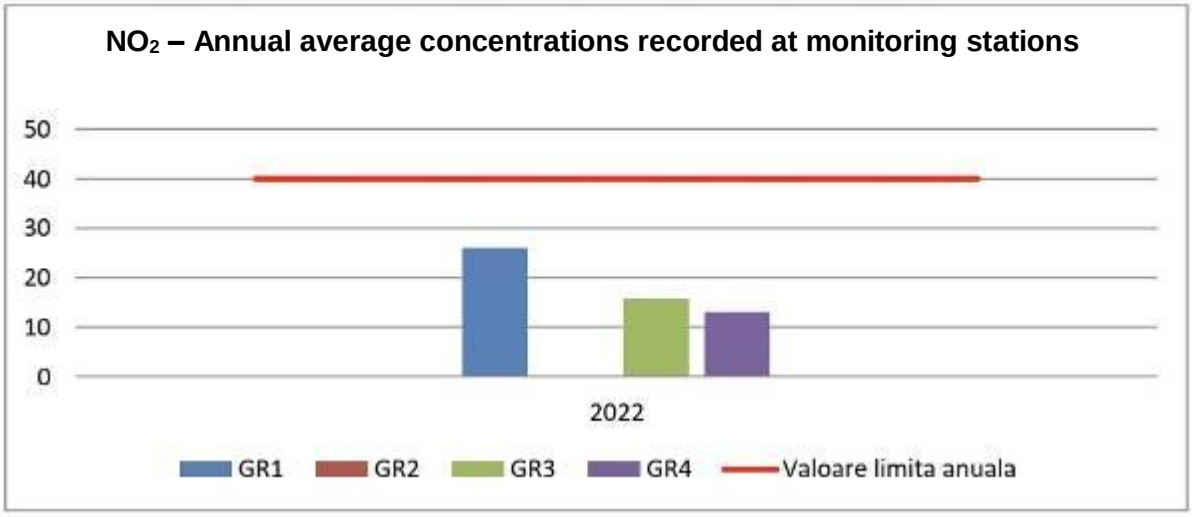
Figure no. 34 - Location of air monitoring stations - Giurgiu county

- ✓ ***Sulphur dioxide***

Based on the information on the Giurgiu EPA's website from the Annual Environmental Report for the year 2022, at the GR 4 station, due to technical reasons there were no data to fulfil the data capture criteria according to Law 104/2011, regarding sulphur dioxide.

- ✓ ***Nitrogen dioxide***

The main potential sources of NO_2 pollution in Giurgiu County are combustion processes from industrial activities, residential heating and motor traffic.



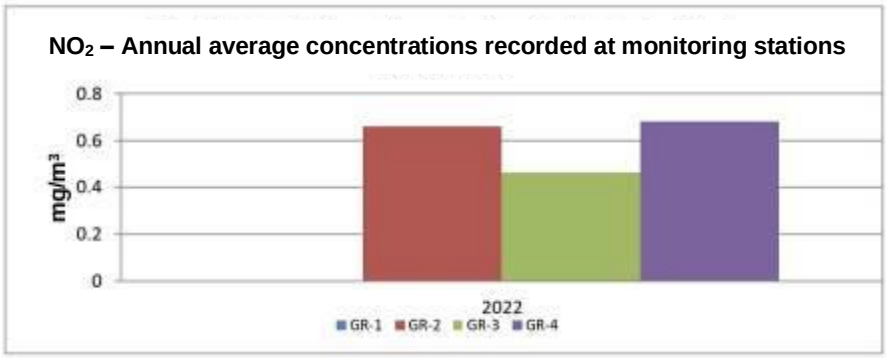
The annual limit value of 40 µg/m^3 was not exceeded at monitoring stations in Giurgiu County.

- ✓ ***Particulate matter - PM2.5***

The smaller the particulate matter, the more dangerous it is to human health. Suspended particulate matter, PM2.5, is particulate matter less than 2.5 microns in diameter suspended in air. PM2.5 particulate matter is monitored in Giurgiu county at station GR4 - rural station. For technical reasons, for PM2.5 there are no data to fulfil the data capture criteria under Law 104/2011.

- ✓ ***Carbon monoxide (CO)***

Carbon monoxide comes from combustion processes where natural gas, diesel, petrol or wood are used as fuels.



In the year 2022 there were no exceedances of the daily maximum 8-hour mean value for carbon monoxide – 10mg/m^3.

- ✓ ***Benzene***

Potential sources of benzene pollutants are road traffic, fuel distribution activities (petrol stations). Coal burning and activities using chemical solvents are also sources of benzene pollution.

For technical reasons, there are no data to fulfil the data capture criteria under Law 104/2011 for benzene.

In conclusion, in 2022, in Giurgiu County, at the monitoring stations, no values exceeding the limit values set by the legislation, namely Law No. 104/2011 on ambient air quality were recorded.

In Giurgiu County no effects on human health due to ambient air pollution have been recorded/reported.

4.2.1.3 Călărași County

In Călărași County, the automatic air quality monitoring network has the following structure:

- Station CL-1, located in the Orizont area, is a traffic station and monitors the influence of traffic on air quality. Pollutants monitored: SO_2, NO_2, NO, NOx, CO, PM10 (automatic and gravimetric methods), benzene: C_6H_6, toluene: C_6H_5-CH_3, ethylbenzene: C_6H_5 - C_2H_5, o, m, p - xylene (automatic methods).
- Station CL-2 located in the area of the Municipal Stadium is a urban station and monitors the influence of urban settlement on air quality. The monitored pollutants are: SO_2, NO_2, NO, NOx, CO, O_3, PM_{10} (automatic and gravimetric methods), benzene: C_6H_6, toluene: C_6H_5-CH_3, ethylbenzene: C_6H_5 - C_2H_5, o, m, p – xylene (automatic methods), Pb, As, Cd, Ni (from PM10) - indicative measurements. In December a low-flow sampler for PM2.5 was delivered and commissioned under the project "Improvement of the Air Quality Assessment and Monitoring System at national level" code MySMIS 2014+ 139703- funded under the Operational Programme for Large Infrastructure (OPLI) 2014-2020.

Meteorological parameters are also monitored (wind direction and speed, temperature, pressure, solar radiation, relative humidity, precipitation).

- The CL-3 station located in Modelu commune, Călărași county is a rural station and monitors the background level of pollution in the rural area. The monitored pollutants are: SO_2, NO_2, NO, NOx, NH_3, CO, O_3, PM10 (automatic and gravimetric methods), PM2.5 automatic methods. Meteorological parameters (wind direction and speed, temperature, pressure, solar radiation, relative humidity and precipitation) are also monitored.

The Air Quality Monitoring Network in the Călărași area consists of three automatic monitoring stations that are part of the National Air Quality Monitoring Network, equipped with high-performance analysers that apply the reference methods required by European legislation.

The pollutants monitored are those provided for in the Romanian legislation transposed from the European one, and the limit values imposed by Law 104/2011, updated, are aimed at avoiding, preventing and reducing harmful effects on human health and the environment as a whole.

The stations are thus located (Fig 35):

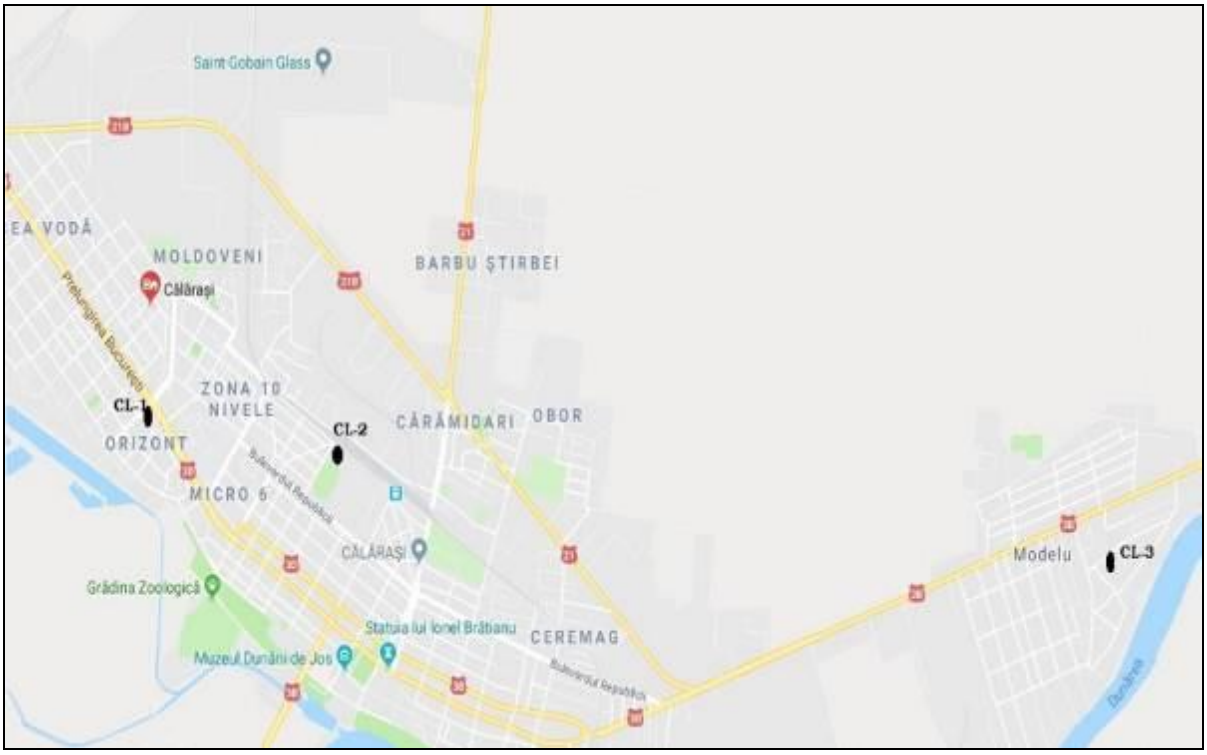


Figure no. 35 - Location of monitoring stations

Out of the 3 monitoring stations in Călărași county, the closest are CL-1 and CL-2 stations in Călărași municipality, respectively, located at a distance of about 60 km from the project area (the port of Oltenița).

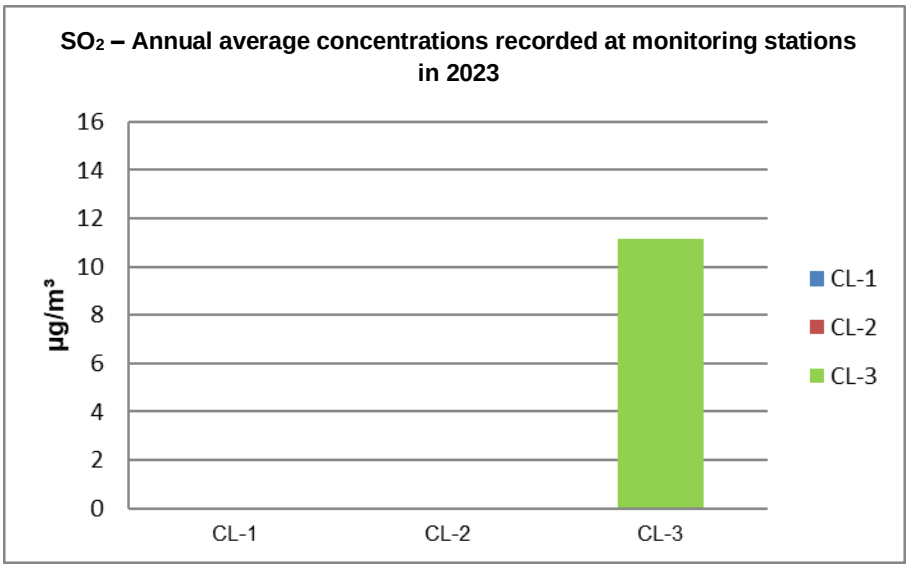
The monitored pollutants, measurement methods, limit values, alert and information thresholds and criteria for the location of monitoring points are laid down in national legislation on atmospheric protection and are in accordance with the requirements of European regulations.

Station	Type	Location	Parameters monitored
CL-1	Traffic	Orizont area	SO_2, NO_2, NO, NOx, CO, PM_{10} (automatic and gravimetric methods), benzene: C_6H_6, toluene: C_6H_5-CH_3, ethylbenzene: C_6H_5-C_2H_5, o-, m-, p – xylene (automatic methods)
CL-2	Urban	Municipal Stadium	SO_2, NO_2, NO, NOx, CO, O_3, PM_{10} (automatic and gravimetric methods), benzene: C_6H_6, toluene: C_6H_5-CH_3, ethylbenzene: C_6H_5-C_2H_5, o-, m-, p - xylene (automatic methods), Pb, As, Cd, Ni (from PM_{10}) - indicative measurements Meteorological parameters: wind direction and speed, temperature, pressure, solar radiation, relative humidity, precipitation.

The annual average concentrations of air pollutants monitored and meeting the quality conditions imposed by Law 104/2011, updated, determined within the NAQMN (National Air Quality Monitoring Network) in 2023 in relation to the annual limit value/target value are presented in the graphs below:

- ✓ ***Sulphur dioxide***

The main potential sources of sulphur dioxide pollution in Călărași county are combustion processes and road traffic.



In 2023, due to technical problems, CL-1 and CL-2 stations were closed.

Sulphur dioxide concentrations in ambient air are assessed using the hourly limit value for the protection of human health (350 µg/m^3).

- ✓ ***Particulate matter - PM10***

Particulate matter in the atmosphere is a long-range transported pollutant originating from natural causes (e.g. entrainment of particles from the ground surface by wind, volcanic eruptions, etc.) or anthropogenic sources such as: energy sector combustion, production processes (metallurgical industry, chemical industry, etc.), construction sites, road transport, industrial and municipal landfills and stockpiles, individual heating systems, especially those using solid fuels, etc.

Concentrations of particulate matter with a diameter of less than 10 microns in ambient air will be assessed using the daily limit value (50 µg/m3), which must not be exceeded more than 35 times/year, and the annual limit value (40 µg/m3).

In the year 2023, due to technical problems, station CL-1 was closed and at station CL-2 data capture for PM10 was 53.13%.

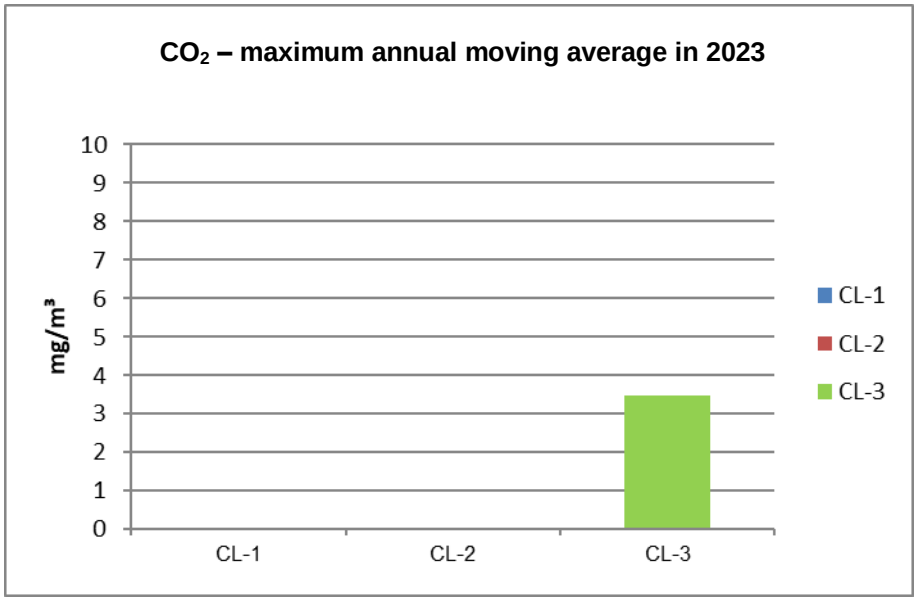
In the year 2023 no exceedances of the annual limit value (40 µg/m3) were recorded at the CL-2 air quality monitoring station.

Due to technical reasons, for stations CL-1, CL-2 there are no data to fulfil the data capture criteria under Law 104/2011.

- ✓ ***Carbon monoxide (CO)***

Carbon monoxide is a highly toxic gas. It originates from anthropogenic or natural sources, involving incomplete combustion in industrial and residential installations (stoves, individual heating plants), from open burning (burning of grass, waste, fires, etc.) and from traffic.

Carbon monoxide concentrations in ambient air will be assessed using the limit value for the protection of human health (10mg/m^3), calculated as the maximum daily value of 8-hour averages (moving average).



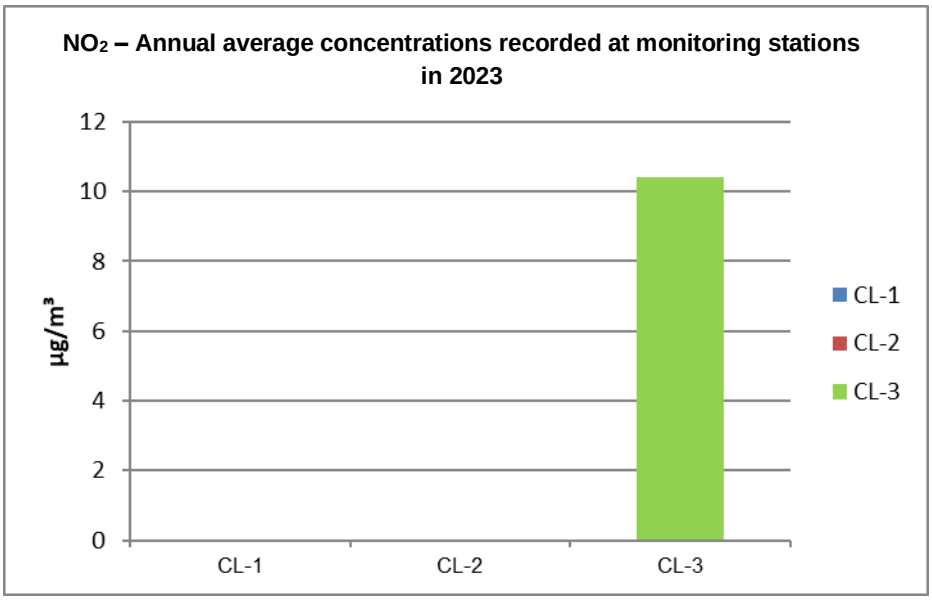
Carbon monoxide is determined automatically at the 3 air quality monitoring stations.

In 2023, due to technical problems, CL-1 and CL-2 stations were closed.

- ✓ ***Nitrogen dioxide (NO_2)***

Nitrogen oxides come mainly from the combustion of solid, liquid and gaseous fuels in various industrial, residential, commercial, institutional and road transport installations.

Concentrations of nitrogen dioxide in ambient air are assessed using the hourly limit value (200 µg/m^3) and the annual average (40 µg/m^3) - for the protection of human health.



In 2023, due to technical problems, CL-1 and CL-2 stations were closed.

In the year 2023, no exceedance of the hourly limit value for the protection of human health (200 µg/m^3) was recorded at station CL-3.

- ✓ ***Benzene (C_6H_6)***

Benzene is a toxic, potentially carcinogenic substance, generated mainly from road traffic, storage, loading/unloading of petrol (depots, terminals, petrol stations), but also from various other activities

with solvent-based products (varnishes, paints, etc.), controlled or open burning of fossil fuels, wood and wooden waste.

Concentrations of benzene in ambient air are assessed using the annual limit value for the protection of human health (5µg/ m^3).

Benzene determinations are carried out at air quality monitoring stations CL-1 and CL-2.

In 2023 the analysers in the two air quality monitoring stations were faulty.

In conclusion, at the level of Călărași county in 2023 no exceedances of the target value for the protection of human health (120 µg/m^3) for ozone were recorded.

Ozone is a secondary pollutant because, unlike other pollutants, it is not emitted directly from an emission source but is formed under the influence of ultraviolet radiation, through photochemical chain reactions between a series of primary pollutants, precursors of ozone: nitrogen oxides (NOx), volatile organic compounds (VOCs), carbon monoxide (CO), etc.

Ozone precursors come from both anthropogenic (fuel combustion, road traffic, various industrial activities) and natural sources.

The photochemical formation of O3 depends mainly on meteorological factors and precursor concentrations. Complex chain reactions, many of them competing, take place in the atmosphere in which ozone is formed and consumed, so that its concentration at any given time depends on a variety of factors such as the ratio of nitrogen monoxide to nitrogen dioxide in the atmosphere, the presence of volatile organic compounds needed to start the reactions, but also on meteorological factors: high temperatures and high solar radiation (which favour ozone-forming reactions), precipitation (which contributes to lower ozone concentrations in the air).

Due to the complexity of physico-chemical processes in the atmosphere and their close dependence on meteorological conditions, ozone concentrations in the lower atmosphere are difficult to control.

Determinations of PM10 particulate matter at station CL-2 showed no exceedance of the daily health limit value (50µg/m3 - not to be exceeded more than 35 times/year).

No human health effects have been recorded/reported in Călărași County.

4.2.2. Influence of pollutants on human health

- ✓ ***Sulphur dioxide (SO_2)***

Sulphur dioxide is a highly reactive gas generated mainly from the combustion of sulphurous fossil fuels (coal, fuel oil) for the production of electricity and heat, and of liquid fuels (diesel) from internal combustion engines in road vehicles. Sulphur dioxide can affect both human health through its effects on the respiratory system and the environment in general (ecosystems, materials, buildings, monuments) through its acidifying effect.

- ✓ ***Nitrogen oxides NOx (NO/NO_2)***

Nitrogen oxides come mainly from the combustion of solid, liquid and gaseous fuels in various industrial, residential, commercial, institutional and road transport installations. Nitrogen oxides have a eutrophying effect on ecosystems and an acidifying effect on many components of the environment, such as soil, water, terrestrial and aquatic ecosystems, as well as buildings and monuments. NO2 is a long-range transport gas and plays an important role in atmospheric chemistry, including the formation of tropospheric ozone. Exposure to high concentrations of nitrogen dioxide causes inflammation of the airways and reduces lung function, increasing the risk of respiratory diseases and aggravating bronchial asthma.

- ✓ ***Ozone O_3***

Ozone occurs naturally in very low concentrations in the troposphere (lower atmosphere). Unlike stratospheric ozone, which protects life forms from ultraviolet radiation, tropospheric ozone (between the ground and 8-10 km above the Earth's surface) is highly toxic, irritating the respiratory tract, irritating the eyes and potentially carcinogenic. Ozone also has a toxic effect on vegetation, inhibiting photosynthesis and causing foliar injury and necrosis.

Ozone is a secondary pollutant because, unlike other pollutants, it is not emitted directly from an emission source, but is formed under the influence of ultraviolet radiation, through photochemical chain reactions between a series of primary pollutants (ozone precursors - NOx, volatile organic compounds, carbon monoxide).

- ✓ ***Carbon monoxide (CO)***

Carbon monoxide is a highly toxic gas that impairs the body's ability to retain oxygen, and in very high concentrations is lethal. It originates from anthropogenic and natural sources, involving incomplete combustion of any type of combustible material, both in energy installations and in residential installations (stoves, individual heating systems) and especially outdoors (burning of grass, waste, fires, etc.).

- ✓ ***Benzene (C_6H_6)***

Benzene is a toxic, potentially carcinogenic substance, generated mainly from road traffic and from the storage, loading/unloading of petrol (depots, terminals, filling stations), but also from various other activities with solvent-based products (varnishes, paints, etc.), the burning of fossil fuels, wood and wooden waste, controlled or open burning.

- ✓ ***Particulate matter (PM10 and PM 2.5)***

Particulate matter in the atmosphere is a long-range transported pollutant originating from natural causes (e.g. entrainment of particles from the ground surface by wind, volcanic eruptions, etc.) or anthropogenic sources such as: energy sector combustion, production processes (metallurgical industry, chemical industry, etc.), construction sites, road transport, industrial and municipal landfills and stockpiles, individual heating systems, especially those using solid fuels.

- ✓ ***Lead (Pb) and other toxic metals: cadmium (Cd), arsenic (As), nickel (Ni) and mercury (Hg)***

Heavy metals are emitted as a result of various combustion processes and industrial activities, and can be included in or attached to emitted particles. They can settle and accumulate in soil or sediments in surface waters. They can have long-term effects through their ability to accumulate in tissues.

4.3 Climate change

Annex 9 to this Report details the climate variations, precipitation, wind intensity and global warming index for each TAU crossed by the project, describing the situation in the period 1971 - 2000 and the future forecast (at the level of 2071 and 2100 respectively) of climate change in the project area of interest.

The following describes the climatic conditions and temperature variations for each of the three counties where the project is located, as they are currently.

4.3.1. Climate conditions in Ilfov County

The climate is temperate-continental with excessive overtones, with hot, dry summers and cold winters, dominated by the frequent presence of cold continental air masses from the E, or arctic from the N, and strong winds that blow snow.

4.3.1.1 Air temperature

The multi-annual average air temperature values show a slight increase from N (10.5º C) to S (11º C). The absolute maximum temperature (40º C) was recorded at Snagov (20 August 1945), and the absolute minimum temperature (-35º C) was also recorded at Snagov (25 January 1942). The amplitude resulting from the accumulation of the extreme values (75º C), as well as that of the monthly average air temperature (25ºC) reflects the character of the accentuated continentalism of the climate of Ilfov County. The multiannual average precipitation oscillates around 500 mm (at Brănești and Vidra). The wind conditions are characterised by predominantly NE winds (21.6%) and E (19.7%)

winds blowing with annual average speeds of 2-2.5 m/s, with winter maxima exceeding 125 km/h.

The data available in the *Statistical Yearbook of Romania 2024* for the weather station closest to the site area in Ilfov County (Bucharest - Filaret station) and for which climate data were recorded, are presented in the table below.

4.3.1.1 Rainfall

Rainfall is highly fluctuating over the course of a year, or even from one year to the next, with annual averages generally exceeding 600 mm. However, due to the central position of Ilfov county in the Romanian Plain, the climate is more moderate than in the eastern part (Bărăgan) and more continentalised than in the western part (Oltenia), so it has a transitional character.

In general, however, the main climatic parameters have relatively similar values throughout the county.

Data available in the Statistical Yearbook of Romania 2024 for the weather station Bucharest - Filaret are presented in Tables 18-19.

The average annual relative humidity is 76-78%, with large non-periodic variations from 18-20%, characteristic of dry and drought periods, to >80%, typical of periods with excess humidity. In the warm season, due to the high temperatures, the relative humidity of the air varies between 40 and 50%, but can drop to below 20% on extremely dry days.

The mean annual atmospheric precipitation gradually decreases from north to south (Tâncăbești, 671.8 mm; Periș, 648.2 mm; Bucharest-Afumați, 575.1 mm; Cernica, 516.2 mm), and from west to east (Mogoșoaia, 628.6 mm and Afumați, 575.1 mm), also registering large non-periodic variations (e.g. Bucharest - Afumați 454.0 mm/1963 and 868.5 mm/1969; Țigănești, 424.2 mm/1965 and 865.6 mm/1955 - the lowest and the highest annual amounts).

Snow cover days are, on average, about 45-55 days per year, with average decadal snow depths of 8-10 cm and absolute decadal maximums of about 100 cm. In some years, violent blizzards occur, especially in the south-eastern part (2-3 days/year).

Table no. 18 - Average monthly and annual temperatures (Bucharest - Filaret weather station)[9]

Average air temperature (monthly and annual)													
Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
1901 -2000	-2.2	-0.2	5.3	11.6	16.9	20.7	22.9	22.4	17.7	11.8	5.5	0.4	11.0
2023	4.7	3.7	8.7	11.1	16.9	22.5	26.5	26.8	22.7	16.6	8.4	4.3	14.4
Maximum and minimum temperature (monthly and annual)													
Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Year	1983	1995	1947	1934	1950	1918	2000	1945	1946	1952	1926	1903	2000
Maximum	16.8	23.0	28.8	34.4	36.6	40.3	42.4	41.1	39.6	35.5	29.4	20.8	42.4
2023 -max	**20.4**	**21.5**	**23.3**	**22.8**	**29.9**	**-**	**40.9**	**40.8**	**35.1**	**32.5**	**-**	**18.2**	**-**
Year	1942	1929	1929	1923	1915	1918	1933	1981	1906	1920	1904	1927	1942
Minimum	-30.0	-24.2	-13.6	-5.5	- 0.2	4.2	8.6	6.6	-1.6	-10.7	-17.8	-26.4	-30.0
2023 -min	**-1.6**	**-7.9**	**-1.9**	**1.8**	**4.9**	**-**	**12.9**	**13.4**	**11.7**	**4.1**	**-**	**-2.9**	**-**

Table no. 19 - Average and monthly precipitation - Bucharest - Filaret weather station[10]

Average precipitation (monthly and annual)													
Period	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**Annual**
1901 - 2000	39.5	33.3	38.1	46.0	68.1	85.8	59.2	50.0	40.6	42.9	47.8	41.4	**567.7**
2023	85.4	4.3	16.1	69.9	29.3	38.2	62.3	10.7	6.6	10.5	71.7	27.2	**432.2**

[9] Source: Statistical Yearbook of Romania 2024

[10] Source: Statistical Yearbook 2024

4.3.1.2 Wind pattern

Under the influence of the Carpathian Curvature, the dominant winds are north-easterly and south-westerly, which decrease in frequency from south to north. The atmospheric circulation analysis shows the highest frequency of winds from the north-east (20.8%) and the lowest for winds from the south (3.1%).

High frequencies are also noted for easterly (18.4%), south-westerly (15.7%) and westerly (14.7%) winds: Budești, 25.0% north-east and 15.7% south-west and Bucharest-Băneasa, 22.8% and 14.9% respectively.

The same evolution, under the influence of the Carpathian Curvature, is also characterised by the atmospheric calm, which averages 12.7% of the whole year (Budești, 31.3%; Bucharest-Băneasa, 19.5%). The average annual wind speed is 2.8 metres per second, but wind intensification is common in March, April and May, when wind speeds can exceed 10 metres per second, with winter highs of up to 125 kilometres per hour. Different average annual wind speed values are recorded at weather stations, depending on the location (Budești, 3.6 m/s; Bucharest-Băneasa, 2.9 m/s); they represent a higher wind energy potential in the south and lower in the north.

The peculiarities of the general circulation of the atmosphere from one season to the next lead to a variety of special meteorological phenomena and processes. Among these atmospheric phenomena, fog stands out. The main cause of its formation is the relatively large lake surfaces in the two valleys (Colentina and Pasărea) and the high concentration of suspended particles in the atmosphere, which form condensation nuclei for water vapour. There are 6070 foggy days per year, almost half of which occur in December and January, when conditions are particularly favourable: a large amount of condensation nuclei in the area of industrial platforms and large boulevards and high relative humidity in the area of the Colentina lakes.

4.3.2. Climate conditions in Călărași county

The climate of the county is temperate continental with a homogeneous pattern, due to the uniformity of the plain relief, characterised by very hot summers and relatively cold winters. In the extreme south of the county, the specific topoclimate of the Danube Meadow is found, with warmer summers and milder winters than in the rest of the plain.

In 2022, the average annual temperature was 13.5 ºC, the annual maximum was 39.9ºC (on 24 July 2022) and the annual minimum was -7.5ºC (on 13 January 2022).

The absolute maximum temperature so far recorded in the county was 44ºC at Valea Argovei (10 August 1957), and the absolute minimum was recorded at Călărași on 9 January 1938 (-30.0 ºC).

The Southern Baragan Plain is seldom in the face of clear atmospheric activity, whether cyclonic or anticyclonic. Most of the time it remains at the crossroads of the main air circulation directions. This is because its geographical position within the continent protects it from the main pressure centres of atmospheric activity and, at the same time, exposes it to atmospheric conditions specific to the interface zones. This is where the following pressure centres are present:

- *Mediterranean cyclones* with trans-Balkan trajectories reactivated over the Black Sea. They are most common in the cold season (October-March). Mediterranean cyclones can also be encountered in the warm half of the year, when they play an important role in the fall of large amounts of precipitation
- *The Siberian anticyclone* is of a thermal, semi-permanent nature; it acts mainly in winter, reaching its maximum intensity and duration in February, as well as in early spring. Under certain conditions, very intense temperature inversions, haze, high cloud cover, heavy snow and blizzards occur. During the summer it is very weak and causes the movement of dry and hot air from the east towards the Baragan Plain, resulting in dryness and drought. In spring and autumn this pressure

centre is the cause of a marked cooling of the air, accompanied by frost and frost and some of the earliest and latest frosts and fogs.

- *The Azorean anticyclone* is dynamic in origin and influences the weather almost all year round. In winter it gets cloudy and damp. Spring and summer cause an active westerly circulation generating precipitation especially when a thermal cyclone forms in the Baragan Plain; sometimes rain showers and hail.
- *The Scandinavian anticyclone* operates in the cold half-year, mostly in winter, but also in summer (June) when cold air advections occur. In winter, there are large drops in temperature, and in certain conditions blizzards.

4.3.2.1 Air temperature

Air temperature is influenced by air masses: the Siberian anticyclone causes excessive heat in summer and a sudden drop in temperature in winter: those in the Mediterranean region generally cause hot, dry weather, while in summer, the hot ones from Africa give a more arid feel.

Analysing data recorded at the Călărași and Oltenița meteorological stations, the average annual air temperature varies between 11.23 ºC and 10.26 ºC. The highest temperatures are recorded in Călărași as a result of the influence of the Danube River, the Borcea Branch and due to the geographical position on the southern side of the plain unit, where the amount of solar radiation is also higher.

Spatially, the temperature values decrease from the east and south-east of the Southern Braganga Plain to the north-west and west of it, with the temperature difference between the east and west of the studied unit being 0.97 ºC due to local topoclimatic conditions.

4.3.2.2 Rainfall

The average annual precipitation recorded at meteorological stations in Călărași county was 648.69 mm/year at Călărași and 695.88 mm/year at Oltenița station.

Spatially, the amount increases from east to west. The lower amounts are due to the action of arid air masses from the north-east. They lose their intensity and act less in the western part of the South Braganga Plain. Thus, the difference of 72 mm/year in the amount of precipitation between the east and the west of the county is attributed to the action of air masses of different origin and intensity.

During the course of a year, the highest amount of precipitation falls in the warm part of the year, with values of 480.2 mm in Călărași and 503.9 mm in Oltenița.

In the cold half of the year, precipitation amounts are generally low as anticyclonic conditions prevail and thermal convection is absent. The amounts of rainfall recorded this season are 168.9 mm in Călărași and 192.3 mm in Oltenița.

4.3.2.3 Wind pattern

As regards the wind pattern, the main role in determining the wind direction is played by the neighbouring relief units of the Romanian Plains. Thus, the Curvature Carpathians, the Dobrogean Plateau and the Balkan Plateau determine the predominant wind direction, together with the action of the main pressure centres.

The annual wind frequency by wind direction shows that westerly winds are predominant in Călărași (17.2%), Oltenița (19.2%), which is also due to the orientation of the Danube valley.

In summer, westerly and north-westerly winds predominate, while in winter northerly and north-easterly winds prevail.

The wind speed is higher in winter (during blizzards it can exceed 10 m/s) and much lower in summer,

when calm atmospheric conditions are common.

It can be observed that due to the low vegetation cover of the lowland surface and the thick layer of soil, the wind dislodges and transports large amounts of dust particles. This is particularly noticeable in the summer, when during dry periods, winds of more than 2 m/) blow dust into the atmosphere. If the wind is very strong, there is a high concentration of dust in the atmosphere, which leads to poor visibility. In summer, in addition to water scarcity, agricultural work such as ploughing, harvesting cereal crops and burning stubble also contributes to soil particle cohesion loss.

In winter, high wind speed (>4m/s) causes larger particles to be transported over small distances on the ground, but in large quantities. Also in winter, most of the land is cleared of vegetation, increasing the areas exposed to wind modelling.

4.3.3. Climate conditions in Giurgiu County

4.3.3.1 Air temperature

The climate is characterised by the county's position within the Romanian Plain and the local geographical conditions. Thus, the temperate-continental climate of the southern part of the country has here transitional characters, resulting from the interface of climatic elements of the western part of the Romanian Plain with those of the eastern part, and the topoclimates are influenced by local characters of natural and anthropogenic units and subunits.

Summers, due to the high radiative balance (120 kcal/year) and the penetration of dry, hot tropical air and dry, warm air from south-eastern Europe, have a highly continental-arid character. Average temperatures in the summer months range from 20.4°C to 23.2°C, with highs reaching 38.7°C.

Winters, under the influence of cold east-continental and arctic air masses, are cold, with many frosty days, with average monthly mean temperatures ranging from +0.3°C to -3.2°C and average monthly minimums from -1.5°C to -16.4°C. Springs have very different onset and duration, alternating cold and cloudy days with warm and clear days.

Autumns, the generally slow transition from summer to winter, are warmer and drier in the first part and cooler and wetter in the second.

4.3.3.2 Rainfall

Precipitation shows a high degree of uniformity in terms of both amounts and timing. Due to low rainfall in the summer months, when evaporation intensifies, there are long periods of drought, resulting in a significant moisture deficit, which is sometimes severely felt by crop plants.

For the colder times of the year, precipitation in the form of snow is typical. In general, there are more than 50 days with snow cover (ground covered), with the first snow falling mainly in late November - early December and the last snow falling in the second half of March.

4.3.3.3 Wind pattern

Air movement, a component of the climate, which is conditioned by the location and modification of the pressure values of the regional or conditional areas and presents the same general characteristics as those of the Romanian Plain, with the local differences being related to the morpho-hydrographic particularities. The frequency by direction is dominated by NE, E and W winds. Calms are highest in September, August and October and lowest in April. Wind speeds vary over time and even across the territory. The NE and E winds are the strongest, with the highest monthly averages in March, April and May and the lowest in July and September, with the average number of days with "strong winds" (11-16 m/s) around 70 and "very strong" winds (above 16 m/s) 5-10.

4.4 Soil

Soil is the thin layer at the surface of the Earth's crust made up of mineral particles, organic matter (humus), water, air and living organisms. Soil is a dynamic system that fulfils many functions and is vital for human activities and the survival of ecosystems. Soil formation (pedogenesis) is the result of the action of physical, chemical, biological and anthropogenic processes on the rocks with the formation of soil horizons, and the chemical composition of soils depends on the rock from which they originated. Soil is of particular socio-economic and environmental importance because it supports human activities by providing agricultural products, biomass and raw materials.

The quality of agricultural land includes both soil fertility and the behaviour of other environmental factors towards plants. From this point of view, agricultural land is grouped into 5 quality classes, differentiated by average bonitation score per country:

- Grade I (very good) - land with no limitations for arable use;
- Grade II (good) - land with reduced limitations for arable use;
- Grade III (medium) - land with moderate limitations for arable use;
- Grade IV (poor) - land with severe limitations for arable use;
- Grade V (very poor) - land with extremely severe limitations, not suitable for arable, vineyards and orchards.

Land quality grades give the suitability of land for agricultural use. The bonitation score is obtained by a complex operation of in-depth knowledge of a piece of land, expressing its favourability for the existence requirements of given crop plants under normal climatic conditions and rational use.

As can be seen from the following, no soil quality data is currently available for any of the three counties in the project site area. Thus, it is recommended that, before starting the execution of works, a soil quality analysis be carried out in areas where it is proposed to carry out hydrotechnical constructions which, during the execution of works, may generate or contribute to the generation of wastewater, areas where material storage areas are being developed / site organisation may be set up which may contaminate the soil

4.4.1. Ilfov County

In Ilfov County, the most widespread soils within the total agricultural area of 98,589 hectares as of 2023 are clayey soils, followed by mollisols and poorly developed soils. The most common soils are all clayey soils, with the other soil grades less represented. The predominant soils in Ilfov County present, in general, a low vulnerability to the impact of many pollutants due to their good buffering capacity (Tab. 20, fig. 36).

Table 20 - Share of agricultural land by grades

	Clasa I	Clasa II	Clasa III	Clasa IV	Clasa V
Arabil	4508	64360	23097	3873	1994
Păşuni şi fanețe	0	62.06	1643	281	45
Vii	148	1082	182	0	0
Livezi	0	733	34	80	0

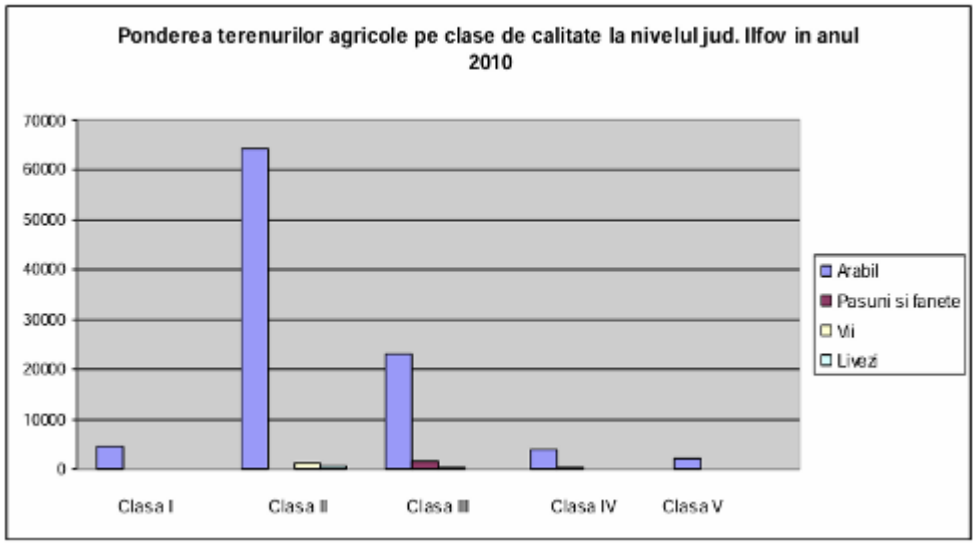


Figure no. 36 - Share of agricultural land

As regards the land affected by various limiting factors - no data are available for Ilfov County.

The same can be said for critical areas in terms of soil deterioration and areas affected by natural processes.

4.4.2. Giurgiu County

At the level of Giurgiu County, based on the data from the annual environmental report and on the pedological and agrochemical studies carried out by the Soil and Agrochemical Studies Office of Giurgiu in 2022, the soil grades were established.

The distribution of arable land by grade and type and quality is shown in Tables 21-22:

Table no. 21 - Distribution of soils by grades and types

Folosință	Clasa I		Clasa II		Clasa III		Clasa IV		Clasa V	
	ha	% din total folosință	ha	% din total folosință	ha	% din total folosință	ha	% din total folosință	ha	% din total folosință
arabil	-	-	1785	15	16488	153,53	3273	24,72	555	6,74
pajiști	-	-	27	10,67	121	47,83	242	87,47	161	20
vii	-	-	20	22,22	-	-	-	-	70	77,78
livezi	-	-	-	-	-		-	-	-	-

Sursa: OSPA Giurgiu

Table 22 - Distribution of arable land by agricultural suitability classes

Nr. crt	Specif.	U.M. (ha)	Clase de bonitare ale solurilor					
			I	II	III	IV	V	Total(ha)
1	Arabil		-	10136	10595	678	692	22101
2	Pajiști		-	-	148	403	-	551
3	Vii			20	-	70	-	90
4	livezi	-	-	-	-	-	-	-
Total			-	10156	10743	1151	692	22742

Sursa: OSPA Giurgiu

Soil quality in Giurgiu County is affected to a lesser or greater extent by one or more restrictions (landslides, floods, erosion, pollution, etc.). They are caused either by natural factors (climate, landforms) or anthropogenic (agricultural or industrial) actions and result in a decline in soil quality. Table no. 23 shows the situation of land with soils affected by factors limiting the agricultural-productive capacity, at the level of Giurgiu County, as a result of paedological and agrochemical studies carried out by the Soil and Agrochemical Studies Office of Giurgiu in 2022.
Table 23 shows the area of agricultural land affected by various limiting factors.

Table no. 23 - Area of agricultural land affected by various factors limiting productive capacity as a result of studies carried out in 2022

Nr. crt	Denumirea factorului	Suprafaţa afectată (ha)	
		total	arabil
1	Seceta	-	-
2	Deşertificare	-	-
3	Exces periodic de umiditate în sol	297	297
4	Eroziunea solului datorită apei	2004	1906
5	Alunecări de teren	-	-
6	Eroziunea solului datorită vântului	-	-
7	Schelet excesiv de la suprafaţa solului	-	-
8	Sărăturarea solului,	-	-
9	din care cu alcalinitate ridicată	-	-
10	Compactarea primară a solului	-	-
11	Compactarea solului datorită lucrărilor necorespunzătoare („talpa plugului")	7102	7102
12	Impermeabilizarea solului (pierderile din zonele agricole pentru urbanizare)	-	-
13	Formarea crustei	-	-
14	Rezervă mică –extrem de mică de humus în sol	3860	3860
15	Aciditate puternică şi moderată	-	-
16	Asigurarea slabă şi foarte slabă cu fosfor mobil	750	750
17	Asigurarea slabă şi foarte slabă cu potasiu mobil	-	-
18	Asigurarea slabă cu azot	-	-
19	Biodiversitatea solului	-	-
20	Carenţe de microelemente (zinc)	-	-
21	Poluarea fizico-chimică şi chimică a solului, din care:	-	-
22	-poluarea cu substanşe purtate de vânt	-	-
23	-distrugerea solului prin diverse excavări	-	-
24	Acoperirea terenului cu deşeuri şi reziduuri solide	-	-

Sursa: OSPA Giurgiu

It can be observed that the limiting factors in the county are periodic excess of soil moisture, soil erosion, soil compaction, low soil humus reserve, phosphorus supply.

Soil quality in Giurgiu County is affected to a lesser or greater extent by one or more natural processes: landslides, floods, erosion, etc. They are caused by natural factors (climate, landforms), and result in a decline in soil quality. At the same time, according to data from the National Agency for

Land Improvement - Giurgiu Regional Branch of Land Improvement, in the county there is an area of 1890 ha of land developed with soil erosion control works.

With regard to the critical areas in terms of soil deterioration, the EPA of Giurgiu has made a preliminary inventory of contaminated/potentially contaminated sites which is constantly updated. It covers 67 sites, 60 potentially contaminated, 7 contaminated. The inventory includes targets from the extractive, energy and chemical industries. The National Strategy and the National Plan for the Management of Contaminated Sites in Romania were approved by GD No 683/2015. Their objectives are:

- to protect human health and the environment from the effects of contaminants resulting from anthropogenic activities while respecting the principles of sustainable development;
- to reduce the surface area of contaminated sites;
- to improve the environmental factors in the location areas and to implement a unitary management at national level.

In this strategic document, Giurgiu County was listed with 224 contaminated/potentially contaminated sites, of which 200 have been remedied, and some of these objectives are included in the updated inventory according to the provisions of Law no. 74/2019.

4.4.3. Călărași County

According to data provided by the County Office of Soil and Agrochemical Studies of Călărași (COSAS Călărași), the distribution of land by grades, according to the mapped area, at the level of 2023, in Călărași county is as follows (table 24):

Table 24 - Soil quality classification[11]

No.	Specification land	Area (ha)	Soil grades				
			I	II	III	IV	V
1.	arable	407604	34744	89726	223862	42922	16350
2.	pasture	11082	-	889	10193	-	-
3.	vineyards	3936	-	1106	2830	-	-
4.	orchards and shrubs	343	-	34	309	-	-
5.	other tree plantations						
6.	unutilised area	504	-	-	-	-	504
	Agricultural total	**423469**	**34744**	**91755**	**237194**	**42922**	**16854**

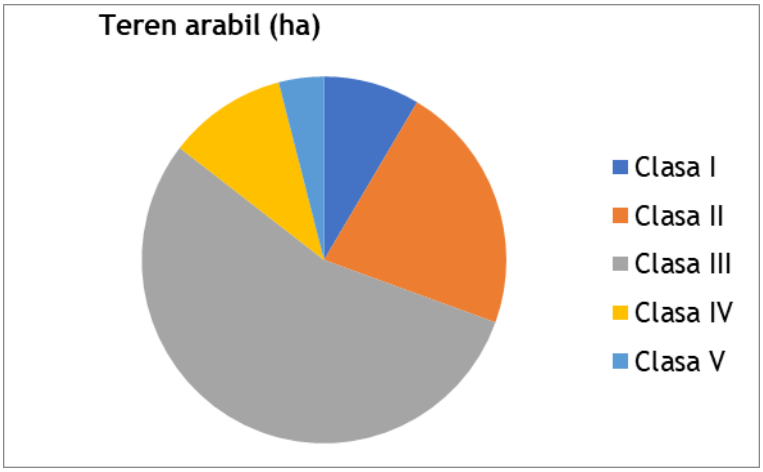


Figure no. 37- Distribution of arable land by soil grades in 2023

[11] *Data source: COSAS Călărași (within the Călărași County Agricultural Directorate)*

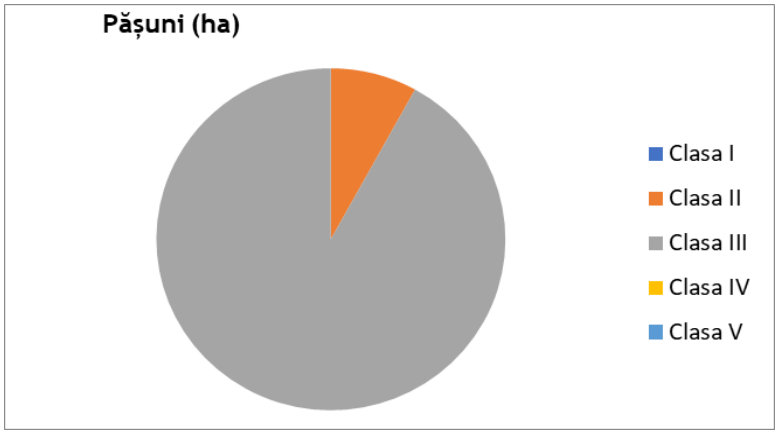


Figure no. 38 Distribution of grassland by soil grades in 2023

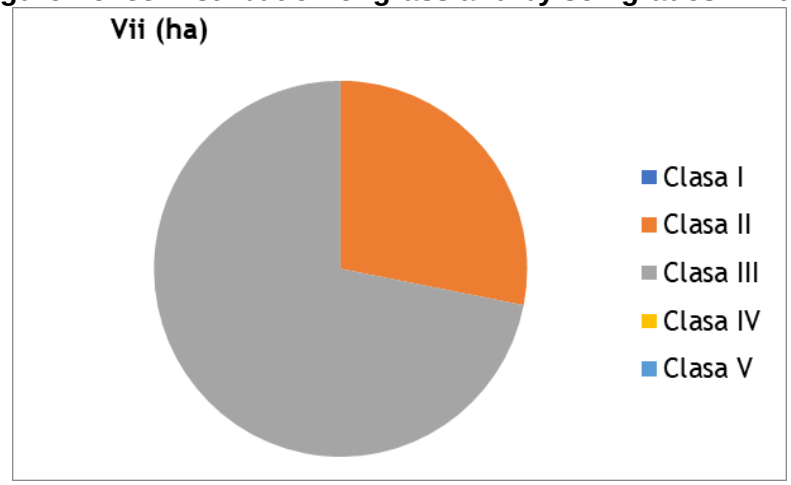


Figure no. 39 - Distribution of vineyards by soil grades in 2023

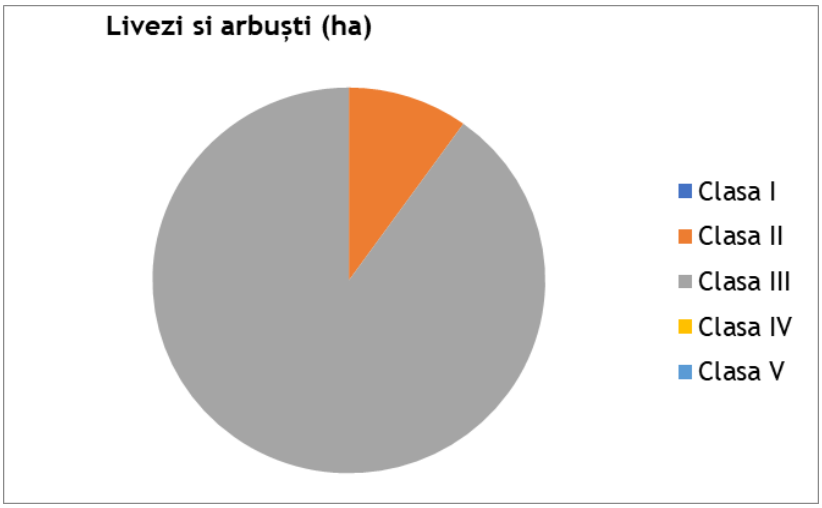


Figure no. 40 - Distribution of orchards and shrublands by soil grades in 2023

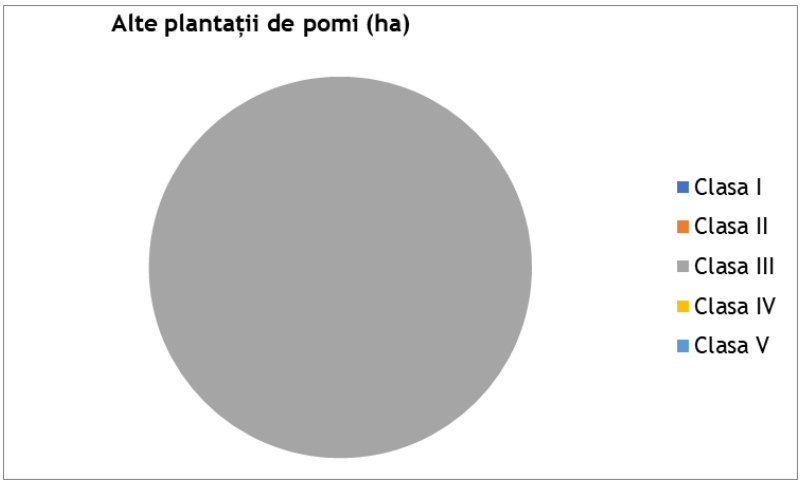


Figure no. 41 - Distribution of other tree plantations by soil grades in 2023

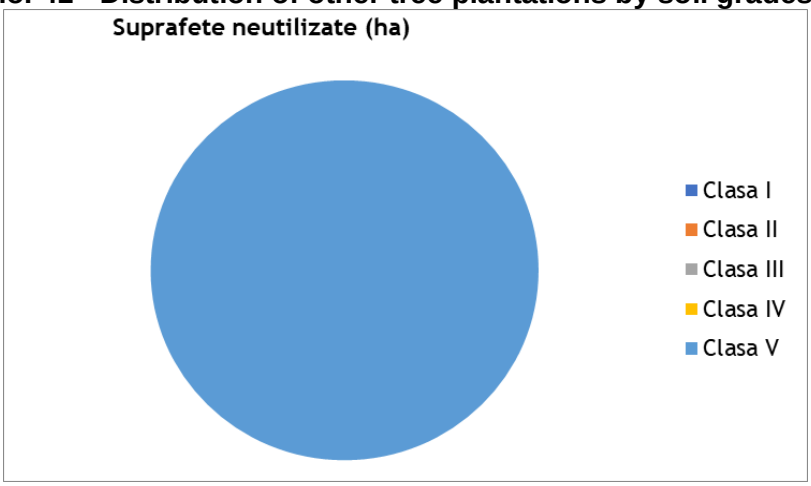


Figure no. 42 - Distribution of unutilised areas by soil grades in 2023[12]

The graphs presented (Figures 37-42) show a slight increase in the areas cultivated with pasture and orchards and tree nurseries.

In terms of limiting factors, soil organic carbon influences soil fertility, water-holding capacity, resistance to compaction, biodiversity as well as sensitivity to acidification or alkalinisation.

There are no data for this indicator at 2023 level.

Soil degradation hotspots can occur in any part of the county if a soil risk factor is involved. With this in mind, consideration should be given to perimeters in the immediate vicinity of farms subject to accidental pollution by salt water, crude oil, etc., perimeters in the immediate vicinity of poultry and pig farms (subject to pollution by animal faeces), perimeters near chemical platforms, etc.

For the areas affected by natural processes, no data are known at the 2023 level.

The management of contaminated sites aims to ameliorate any suspected or proven adverse effects of environmental degradation and to minimise potential threats to human health, water bodies, soil, habitats, food and biodiversity.

EPA Călărași has made, since 2008, a preliminary inventory of contaminated/potentially contaminated sites at county level, which is constantly updated.

It includes targets in the metallurgical, energy, oil and gas and oil extraction industries.

The National Strategy and the National Plan for the Management of Contaminated Sites in Romania were approved by GD No 683/2015. Their objectives are:

[12] *Data source: Călărași County Agricultural Directorate*

- to protect human health and the environment from the effects of anthropogenic activities while respecting the principles of sustainable development;
- to reduce the surface area of contaminated sites;
- to improve the environmental factors in the location areas and to implement a unitary management at national level.

In the EPA database, in Călărași county there is 1 contaminated site (metallurgic industry) in the area of 46,918 ha.

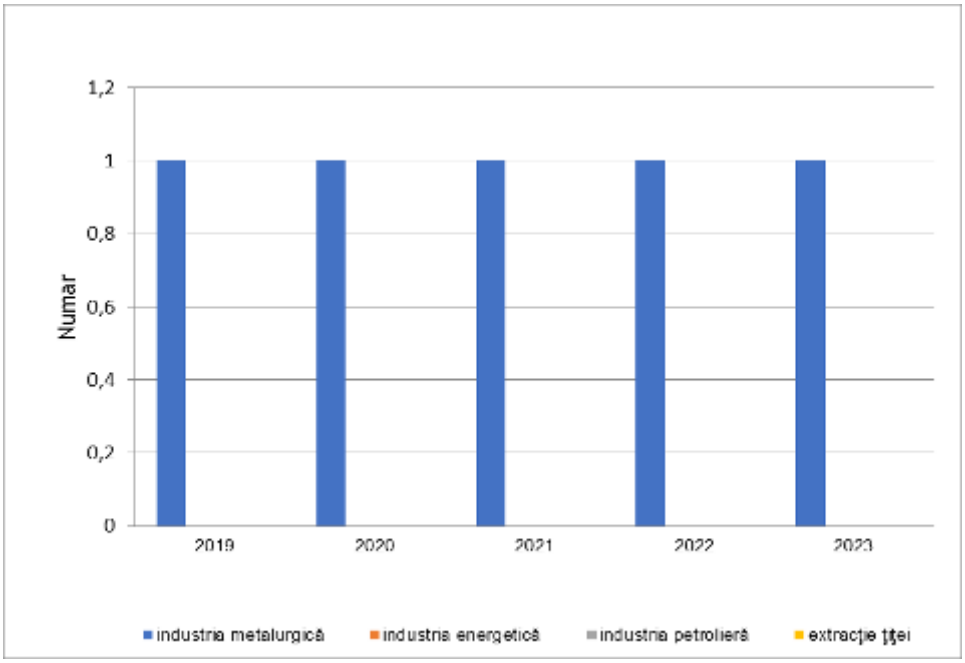


Figure no. 43 - Number of potentially contaminated sites in Călărași county in 2019 -2023

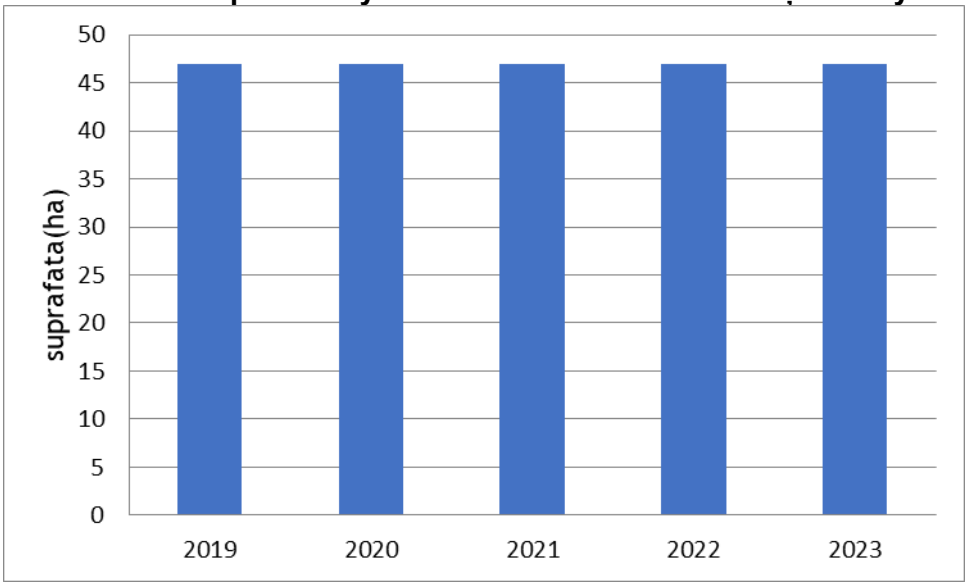


Figure no. 44 - Status of contaminated sites in Călărași County (2019-2023)

As it can be seen from the above, in Călărași County soils are contaminated due to the activities carried out in the metallurgical industry (based on the information from 2019 -2023) (Fig. 43-44). Other sources of soil contamination have not been identified.

4.5 Land morphology

4.5.1. Argeș River

In morphological terms, the course of the Argeș River is characterised by wide bends (meanders), where islands (which are watered during floods) frequently appear. The minor riverbed is 30-90 m wide, while the major riverbed is 200-300 m wide, see Figures 44-48.



Figure no. 45 - Wide meandering appearance. The canal overlaps the Argeș river meadow - currently developed



Figure no. 46 - The port of Oltenița platform area (reach 1) on the Argeș river - developed canal



Figure no. 47 - Area of the HN1 of Oltenița (reach 1) on the Argeș river - developed canal



Figure no. 48 - Port of 1 Decembrie area (reach 5) - developed canal

The route of the canal overlaps the meadow area (over the minor and major riverbed) of the Argeș River, where the land elevations are between 18.0 ÷ 20.0 m (in the area where the Argeș River flows into the Danube River), between 46 - 48.2 m (in the area of km 56+000), between 52.2 - 52.60m (in the area of km 60+000), between 62.3 - 64.2 m (in the area of km 70+000) and between 76.7-79.0 m in the area of hydrotechnical node 5 (HN5) of Mihăilești.

4.5.2. Dâmbovița River

From a geomorphological point of view, the perimeter is located in the Dâmbovița river meadow, which separates on a general NNE-SSW direction the Vlăsiei Field from the Mostiștei Field.

Floodplains and ponds, as well as minor riverbeds, are predominantly influenced by alluvial processes, bank erosion, sediment deposition, and vegetation-assisted siltation, as well as by certain anthropogenic activities (such as sand and gravel extraction, damming, etc.). Valleys originating in the plain are not subject to alluviation, instead exhibit bank erosion and, at times, even vertical erosion;

currently, the formation of temporary ponds and shallow lakes is typical. Intense alluvium phenomena occur in the meadow of the Argeș and Dâmbovița rivers. Dâmbovița River, however, due to damming, has experienced a reduction in sediment deposition processes. Land degradation in meadows is associated with sediment accumulation, flooding, and excess soil moisture. This last issue may also occur on large stretches of plain and in many diked enclosures. Some of this land could have avoided excess moisture retention if timely dredging of drainage and irrigation canals had been carried out, as they failed to ensure proper water evacuation.

4.6 Geology

4.6.1. Geology of the site

Geologically, the canal route falls within the large unit known as the Romanian Plain (Outer Plain). The formations encountered in the boreholes date from the Quaternary (Pleistocene and Holocene), Cretaceous (Cr), and Upper Pliocene (P) periods.

According to the consulted documentation, the geological formations in the study area belong to the Lower Pleistocene (e.g., Frătești strata), Upper Pleistocene (e.g., Mostiștea sands, terrace gravels), and Holocene (gravels and sands of the alluvial plain, etc.) (see the geological map along the canal route, scale 1:200,000, and the attached longitudinal and cross-section geo-lithological profiles).

The regional geological structure has the following lithological composition at depth:

- *UPPER HOLOCENE (qh2)*
  - alluvial deposits from meadows and low terraces - loess-like clayey-silty deposits 6-15 m thick on low terraces; in floodplains, these are composed of clays, silts, sands, gravels, with intercalated mud and peat layers, forming an interdigitated facies. The thickness of alluvial deposits in meadows is highly variable.

- *UPPER PLEISTOCENE (qp3):*
  - deposits of high plains (Mostiștea and Vlăsia) consist of surface loess-like clayey-silty layers, slightly sandy, 10-20 m thick, underlain by sands and gravels up to 7-12 m thick.
  - the Mostiștea sands, the intermediate deposit horizon, and the Colentina gravels are composed of fine to medium sands with clayey-silty intercalations, with variable thickness (8-12 m). Mostiștea sands appear along the right bank of the Dâmbovița River north of Gruiu. The Mostiștea sands are overlain by a discontinuous calcareous horizon, more common around Bucharest, known as the "Intermediate Deposits Horizon". The thickness of this horizon can reach 5-8 m. Above this horizon lie the Colentina gravels, considered the alluvial deposits of the old Argeș River course. These gravels are up to 5-8 metres thick. They are exposed on the right bank of the Dâmbovița River downstream of Podul Pitarului.

- *MIDDLE PLEISTOCENE (qp2):*
  - the marly complex is laid out on the Frăteşti strata. It consists of alternating marls, clays, and sands, ranging from 100-120 m thick around Bucharest at 5-10 m at the confluence of the Dâmbovița and Argeș rivers;

- *LOWER PLEISTOCENE (qp1):*
  - "Frătești" strata - composed mainly of sands in the upper part and sand with gravel and boulders towards the lower part. In Bucharest, they are found at depths greater than 120–150 m and can be up to 100 m thick. In this area, the Frătești strata complex is divided into three horizons by two interbedded clay layers, which thin out and disappear to the south. Toward the Dâmbovița-Argeș

confluence, the Frătești strata appear as a single horizon, 15-25 m thick, found at shallow depths, sometimes directly beneath the meadow alluvium.
From a tectonic point of view, the area has a typical monoclinal platform structure.

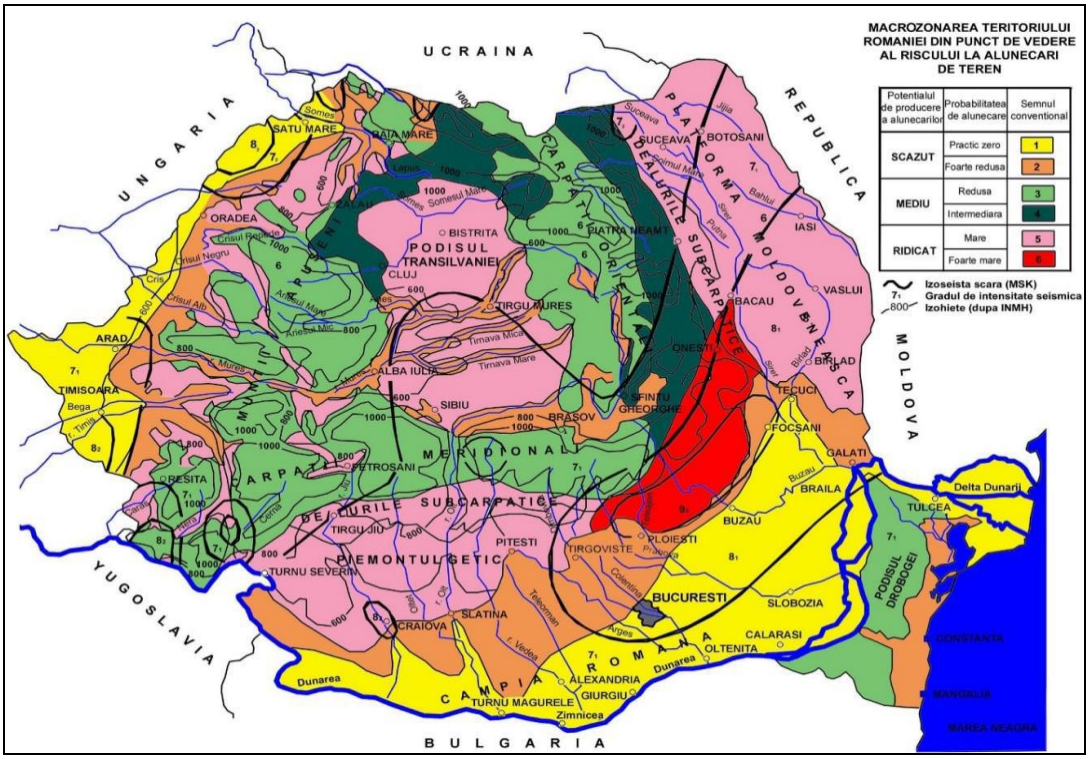
4.6.2. Stratification and geotechnical characteristics of the land

The Geotechnical study for the Argeș river and Geotechnical study for the Dâmbovița river are enclosed herewith.

These studies detail the geotechnical characteristics of the area, based on boreholes drilled at several points in the site area.

4.6.3. Landslides

According to *WG 025-2000 "Guide to the macrozonation of the Romanian territory in terms of landslide hazard"*, the area of interest is characterised by low, practically zero or very low potential (Figure 49).



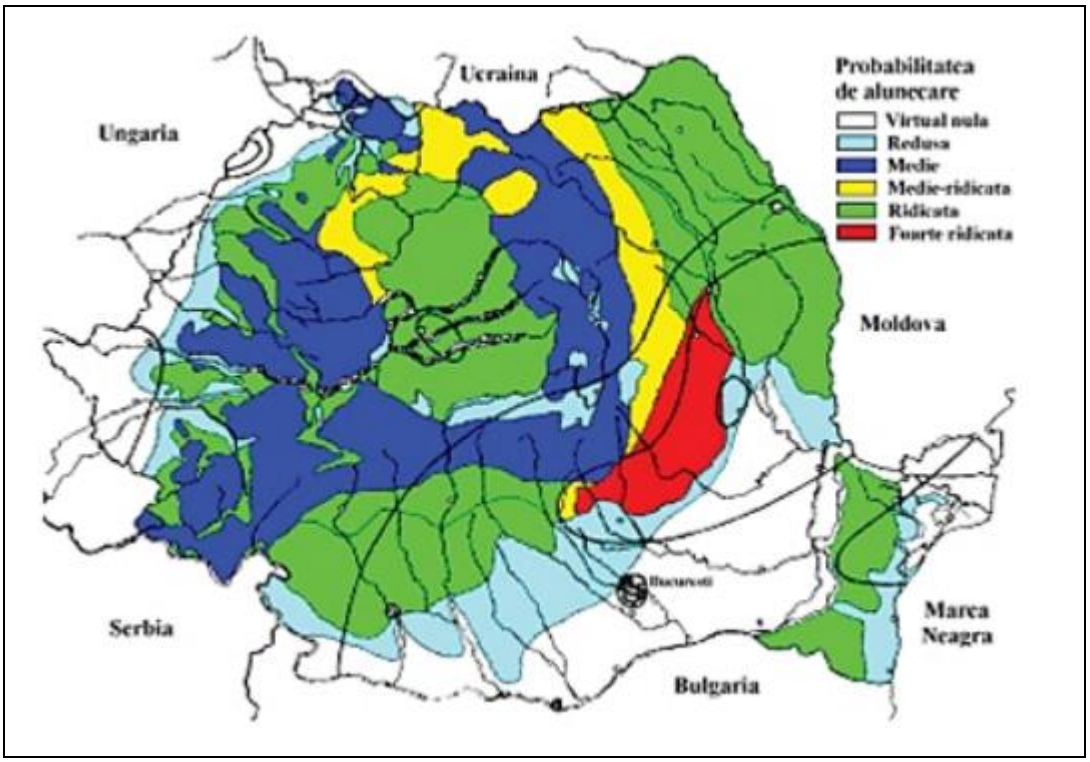


Figure no. 49 - Landslide map of Romania

4.6.4. Frost depth

4.6.4.1 Argeș River

The maximum frost depth of natural ground according to STAS 6054/77 is 0.7 - 0.8 m.

4.6.4.2 Dâmbovița River

According to STAS 6054/77 "Foundation Ground - MAXIMUM FROST DEPTHS - Zoning of the Romanian Territory", the maximum frost depth is 0.9 m.

4.6.5. Seismicity of the area

From the seismic point of view, according to STAS 11100/1-93 "Seismic macrozonation of Romania", the route of the canal falls as follows:

- ✓ under macrozone of grade 7_1 (between Oltenița - Budești - Copăceni);
- ✓ under macrozone of grade 8_1 (between Copăceni - Mihailești).

According to the "*Seismic Design Code for Buildings*", indicative P100/2006, the route of the canal falls (on the section between Budești (upstream) and Mihăilești) under the seismic hazard zone corresponding to a ground acceleration (ag)=0.24g (for earthquakes with a mean recurrence interval (MRI) of 50 and 100 years) corresponding to a corner period Tc = 1.6 seconds, while the Oltenița - Budești area corresponds to a ground acceleration (ag) = 0.20 g with a corner period Tc = 1.0 sec.

The documentation consulted shows that, in order to substantiate the seismicity problem, seismicity studies were carried out by the Earth Physics and Seismology Centre along the canal route and seismic measurements were performed in the field, both in boreholes (in the Crivăț - Grădiștea area) and on the ground surface.

At the date of this report, due to seismic map updates according to P100-1/2013 standard, the site has the following characteristics:

- on the section between Budești (upstream) and Mihăilești, in the seismic hazard zone corresponding to a ground acceleration (ag)=0.30 g (for earthquakes with an mean recurrence interval (MRI) of 50 and 100 years), with a corresponding corner period Tc = 1.6 seconds
- Oltenița - Budești area corresponds to a ground acceleration (ag) = 0.25 g with a corner period Tc = 1.0 sec.

4.7 Biodiversity

The project is implemented in 3 counties: **Ilfov, Giurgiu, Călărași,** whose ecological potential allows the development of vegetative associations that can be categorised in the area of silvosteppe, steppe and deciduous forests.

➢ Ilfov County

On the territory of Ilfov County, there are the following types of natural habitats: acclimatised Indian lotus (characteristic of Lake Snagov), dystrophic lakes and ponds (near Buftea, Mogoșoaia, Chitila, Cernica, Grădiștea, Snagov, Balta Neagră, Mânăstirea Țigănești).

Ilfov County is characterised by high biological diversity, with protected species of flora and fauna.

In terms of birds, Ilfov County is characterised by the existence of the following bird species: Garganey *(Anas querquedula*), Mallard *(Anas platyrhyncos*), Common Teal *(Anas crecca*), White-fronted Goose (*Anser albifrons*), Common Moorhen (*Gallinula chloropus*), Common Coot (*Fulica atra*), Northern Lapwing (*Vanellus vanellus*), Purple Heron (*Ardea purpurea*), Common Cuckoo (*Cucullus canorus*), Long-Eared Owl (*Asio otus*), Barn Owl (*Tyto alba*), Little Owl (*Athene noctua*), Short-eared Owl (*Asio flammeus*), European Bee-eater (*Merops apiaster*), Common Swift (*Apus apus*), Eurasian Hoopoe (*Upupa epops*), Common Kingfisher (*Alcedo atthis*), Grey-headed Woodpecker (*Picus canus*), Syrian Woodpecker (*Dendrocopos syriacus*), Middle Spotted Woodpecker (*Dendrocopos medius*), Barn Swallow (*Hirundo rustica*), House Martin (*Delichon urbica*), Sand Martin (*Riparia riparia*), White Wagtail (*Motacilla alba*), Red-backed Shrike (*Lanius collurio*), Great Cormorant (*Phalacrocorax carbo*), *Egretta garzetta.*

➢ Giurgiu County

The habitats of **Giurgiu County** are characteristic of the lowland, forest-steppe area and port numerous species of plants and wild animals with a special ecology.

In Giurgiu County, the forest-steppe zone is represented by islands of greyish oak forests, mixed in places with downy oak, Turkey oak and Hungarian oak. Heavy anthropisation of the geographical landscape has removed much of the spontaneous vegetation. Agricultural crops dominate, leaving only very small areas of secondary grassland with *Festuca valesiaca, Stipa sp., Poa pratensis, Botriochloa (Andropogon) ischaemum* etc.

The deciduous forest area occupies the plain between Argeș and Neajlov and the north-western part of the county. The specific vegetation cover of the area has undergone large anthropogenic transformations through the expansion of arable land. The forests appear as small, small islands of ancient woodlands and are made up of Turkey oak and Hungarian oak. Alongside these forests there are lowland areas with oak, lime and hornbeam.

The undergrowth of these forests hosts species such as the Common Hawthorn *(Crataegus monogyna),* Common Privet *(Lugustrum vulgare)*, Dog Rose *(Rosa canina)*, Cornelian Cherry *(Cornus mas)*, Blackthorn *(Prunus spinosa)*, Dogwood *(Cornus sanguinea)*, Common Elderberry *(Sambucus nigra)*, Common Spindle Tree *(Euonymus europaeus)*. The secondary grasslands, also limited in area, are made up of associations of grasses *(Festuca valesiaca, F. pseudovina, Poa pratensis ssp. Angustifolia etc.).*

In the common meadow of the Argeș and Sabar rivers, as well as the Danube, the ecological conditions allow the development of coppices of willow *(Salix alba, sp. Fragilis*) and poplar *(Populus alba, P. nigra)*, alternating with hybrid black poplar plantations. In the higher parts of the meadow, there are often meadow scrublands of oak, ash and elm. Among shrubs, the most widespread are hawthorn, dog rose and privet. The herbaceous vegetation consists mainly of field grass (Agrostis alba), meadow foxtail *(Alopercus pratensis)*.

The area of vegetation in the excess moisture land around ponds and lakes is represented by willow, poplar, alder and willow, and in the lower parts by lesser pond-sedge, cane and reed.

In Giurgiu County, the fauna is mainly represented by rodents (European ground squirrel, European hamster, steppe polecat, field mouse), waders (garganey, purple heron, red-legged nuthatch, nuthatch, common coot, green sandpiper). The woodland fauna, made up of forest-dwelling species, is made up of mammals such as fallow deer, red deer, wild boar, roe deer, fox and squirrel. Of the birds, the most common are the pheasant, colonised in the Albele and Ghimpați forests, and the woodcock, both widespread in most of the forests, especially in the north, west and south-west of the county.

The fauna of the open plains is represented by several species, the most numerous of which are: rabbit, ferret, stoat, weasel - all of hunting interest, as well as ground squirrel, European hamster, field mouse, etc. In general, birds are not specific to these places, except for a few species: common quail, European bee-eater, Eurasian skylark. As well as birds, there are snakes, lizards, frogs and various insects.

In the rest of the county there are Great Bustards *(Otis tarda*), a protected bird. Otters and mink live near the water's edge, while rabbits, foxes and wild boar live in the coppices and meadows.

The rivers and lakes are home to a wide variety of fish: pike, carp, crucian carp, rudd, seabass, carp, Prussian carp, bream, Northern pike, Danube bleak, tench, common roach, zander, as well as - in the Danube only - beluga, Danube sturgeon and mackerel.

- **Călărași County**

The flora and fauna of **Călărași county** are characteristic of the steppe and forest-steppe area, being directly influenced by the state of the environmental factors in the county and beyond

In terms of habitats, Călărași County is made up of 98% of anthropized habitats, dominated by plains.

The habitat classes found in Călărași County are:

- Freshwater habitats
- Swamps
- Forests
- Grassland
- Shrubland

Their distribution by Natura 2000 site is shown in the following tables[13]:

ROSCI0131 Olteniţa-Mostiştea-Chiciu

Code	Habitat name	Conservation status	Habitat class
3270	Muddy rivers with *Chenopodion rubri* and *Bidentiom*vegetation	B	swamps
3150	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* vegetation	B	freshwater habitats
3130	Oligotrophic to mesotrophic standing waters with vegetation of *Littorelletea*	B	freshwater habitats

[13] https://apmcl.anpm.ro/rapoarte-anuale1

	uniflorae and/or *Isoeto-Nanojuncetea*		
6510	Lowland grasslands *(Alopecurus pratensis, Sanguisorba officinalis*)	B	Grassland

ROSCI0343 Forests of the Mostiștei silvosteppe

Code	Habitat name	Conservation status	Habitat class
40C0	Ponto-Sarmatic deciduous thickets	B	
91I0	Euro-Siberian steppic woods with *Quercus* spp.	B	forests

ROSCI0319 Fetești Marshes

Code	Habitat name	Conservation status	Habitat class
92A0	Coppices with *Salix alba* and *Populus alba*	C	forests

ROSCI0022 Canaralele Dunării (Danube limestone cliffs)

Code	Habitat name	Conservation status	Habitat class
92A0	Coppices with *Salix alba* and *Populus alba*	A	forests
91F0	Mixed riparian forests with *Quercus robur*, *Ulmus laevis, Fraxinus excelsior* or *Fraxinus angustifolia*, along the large rivers *(Ulmenion minoris*)	B	forests

The majority of the habitats of Community importance in Călărași county reach a good conservation status (B).

In Călărasi county, most vegetation is represented by technical and cereal crops.

The forest vegetation, which occupies 4.3% of the county's surface area, consists mainly of the following species: hybrid poplar, acacia, pedunculate oak, lime, Tatarian maple.

The secondary steppic grasslands are composed of Volga fescue *(Festuca valesiaca),* yellow bluestem *(Botriochloa-Andropogon-ischaemum),* spear grass *(Stipa capilata), etc.*

The Argeș and Danube meadows are characterised by meadow coppices of willow and poplar, lowland stands with oak *(Quercus robur)*, ash *(Fraxinus excelsior*), elm and hybrid poplar plantations, interspersed with meadow floodplains with *Agrostis stolonifera, Alopecurus pratensis, Agropyron repens* and cultivated land.

The intra-zonal vegetation is represented by associations of halophilous plants with *Salicornia europaea, Camphorosma annua*, etc., both at the confluence of the Argeș and Dâmbovița rivers and in the Danube's meadow.

In the perimeter of the ponds and marshes there is a hydrophilous vegetation consisting of cane, reeds, water-lily, pond-sedge, creeping buttercup, duckweed, etc.

The wild fauna of Călărasi county is very rich in species of hunting interest, among which we mention the wild boar, roe deer, pheasant, rabbit, fox. The steppe and silovsteppe area is populated with typical elements adapted to agro-biocenoses such as rabbit, partridge, quail, grass lizard, water snake, steppe polecat. Pheasant and, in some places, roe deer have acclimatised in the forests.

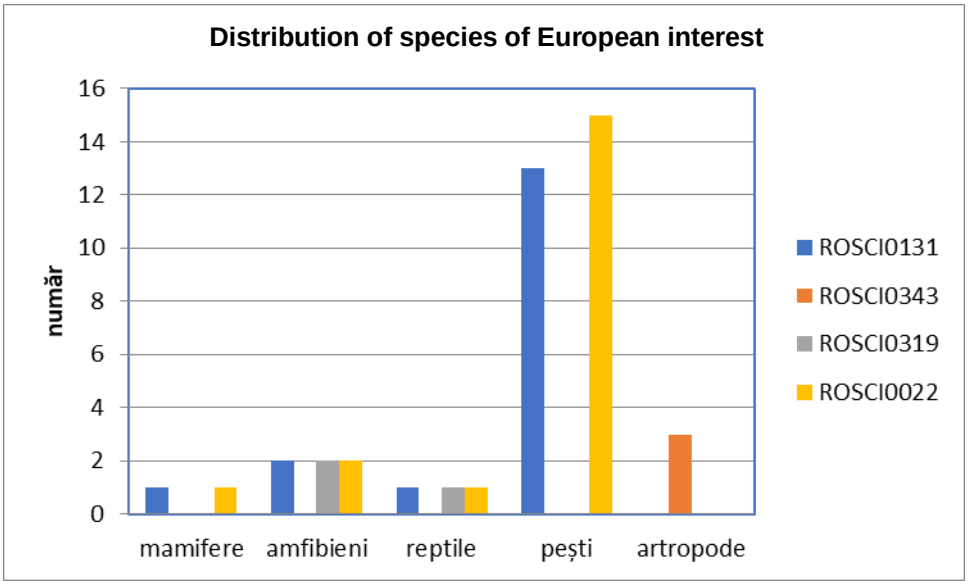
The fauna of meadows and lakes is much richer. It is represented by the otter *(Lutra lutra*), the fox

(Vulpes vulpes), plus the common raccoon dog *(Nyctereutes proczonoides ussuriensis Matschie*) and the muskrat *(Ondatra zibethica*), which have migrated to the Danube meadow, east of Călărași.

The diversity of the natural characteristics of the meadow has also determined the existence of numerous living environments, so that in the meadow between Oltenița and Călărași there are three categories: aquatic fauna in the riverbed and the Danube pools, forest fauna and grassland fauna. The marshes and ponds are home to bird species such as the mallard, the common coot, the pallid harrier.

The ponds and lakes are home to legally protected species, as well as rare, globally endangered species protected under international conventions (Bonn, Bern, Rio). These include the little cormorant, Red-breasted Goose, White-fronted Goose, ferruginous duck, Dalmatian Pelican, Egretta garzetta, etc., but also sedentary species of passage migrants, which have found here the conditions for feeding, resting and breeding.

At county level, 42 species of animals of European interest were assessed, including 2 species of mammals, 6 species of amphibians, 3 species of reptiles, 28 species of fish, 3 species of arthropods. Their distribution is shown in the figure below:



4.7.1. Protected natural areas

➢ **Ilfov County**

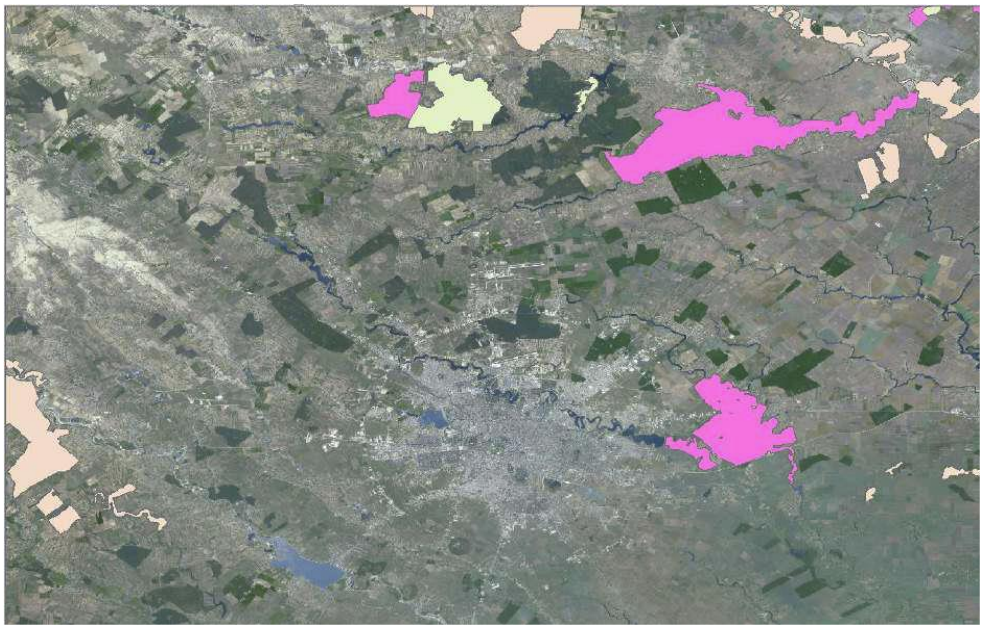
Ilfov County has 8 protected natural areas[14], of which:

- 3 protected natural areas of national importance:
  - Snagov Lake (100 ha declared by Law 5/2000),
  - Snagov Forest (10 ha, declared by Law 5/2000)
  - Scroviștea Natural Protected Area (overlapping the Natura 2000 site Scroviștea ROSAC and ROSPA, declared by H.G. No.792/1990)
- 5 protected natural areas of Community importance:
  - Cernica Lake and Forest - Site of Community Importance (ROSCI 0308) - 3267 ha, declared by Order 2387/2011
  - Cernica Lake and Cernica Forest - Special Protection Area for birds (ROSPA 0122) - 3744 ha, declared by GD 971/2011

[14] https://www.anpm.ro/web/apm-ilfov/rapoarte-anuale1

- Grădiștea - Căldarușani - Dridu - Special Protection Area for birds (RO SPA 0044) - 6442 ha, declared by GD 1284/2007 on the declaration of special protection areas for birds, as part of the Natura 2000 European ecological network in Romania
- Scroviștea - Site of Community Importance (ROSCI 0224) - 3391 ha, declared by Order 1964/2007, which became a Special Area of Conservation (RO SAC 0224) declared by GD 685/2022 as subsequently amended and supplemented
- Scroviștea - Special Protection Area for birds ROSPA 0140 - 3356 ha, declared by GD 971/2011

The network of protected areas in Ilfov County is presented in the following map:



Nationally designated protected natural areas:

1. The ***Snagov Forest Protected Natural Area*** is located in Ilfov County, in the commune of Snagov, within the territorial-administrative radius of the Snagov Forest Range, Snagov-Park forest body. The main access point to the protected natural area is in Ciolpani commune, on the national road D.N.1 Bucharest-Ploiești. The predominant vegetation is forest. The protected natural area of Snagov Forest has been designated as a nature, geobotanical and forest reserve, with an area of 10 ha.

The Snagov Forest is a protected area for the conservation of stands for scientific research, including natural elements of particular dendrological value, offering the possibility of research and visiting for educational purposes. It has been designated as a protected natural area due to the existence of 15 specimens of beech *(Fagus sylvatica)*, a species that is usually characteristic of hilly areas.

Other tree species include: *Tilia cordata, Quercus robur, Quercus cerris*. Hazel, hawthorn, common privet and elderberry thickets thrive among the massive trees, and in spring snowdrops, crocus, fumewort, lily-of-the-valley and martagon lilies.

The Snagov Forest Protected Natural Area has no management plan.

2. Snagov Lake Protected Natural Area has been designated as a nature reserve and is considered an important wetland, with an area of 100 ha. Snagov is the most important recreational lake around the capital, being the most picturesque of the tourist attractions in the area, whose beauty is complemented by the surrounding forests. It is a river creek of the Ialomița River.

It covers an area of 5.75 km^2, is 16 km long and has a maximum depth of 9 metres (the deepest lake in the Romanian Plain). Water collects in the lake from the groundwater table and only to a small extent from rainwater and snow. That is why the water level in Snagov Lake is constant except in

spring and often in autumn.

The shape of the lake is elongated and very sinuous, with many bays, in the downstream part of the lake there is an island on which Snagov Monastery is located.

A large part of the lake (100 ha) has been declared a protected area by Law 5/2000, to protect the fauna and flora that thrive here.

Following the studies carried out in 2011-2012 for the preparation of the Snagov Lake Protected Natural Area (SLPNA) Management Plan, the following habitats and species of community interest of the Natura 2000 Network were identified on the territory of the SLPNA:

- 2 habitats: 3150 Natural eutrophic lakes - Characteristic and dominant species are: *Lemna minor* (common duckweed), *Spirodela polyrhiza*, *Salvinia natans* (floating fern). The phytocenoses of this habitat are floating, but are interspersed with cane or reedbeds that can reach over 2 metres in height. The coverage is over 95%. Habitat 3150 is suitable for *Aldrovanda vesiculosa* (waterwheel plant), a plant that has been identified in the past from several areas of Snagov Lake, but which at this time has only been identified at Siliștea Snagovului, outside the SLPNA,

- 3160 Natural dystrophic lakes and ponds) - Characteristic and dominant species are *Nymphaea alba* (white waterlily), *Nuphar luteum* (yellow pond lily) and *Potamogeton natans*. Other plants present in the habitat are: *Ceratophyllum demersum, Myriophyllum spicatum, Hydrocharis morsus-ranae, Potamogeton crispus, Lemna minor*. No rare species have been identified, but characteristic species are out-competed by *Nelumbo nucifera* (pink lotus).

- 48 protected species, including:

- 18 species of wild birds, protected under the Birds Directive 2009/147/EC (10 under Annex 1, 1 under Annex 2 and 7 under Annex 3) and the local Red List (Romania), namely *Chlidonias hybridus, Chlidonias niger, Corvus frugilegus, Ardeola ralloides, Egretta alba, Egretta garzetta, Fulica atra, Gallinula chloropus, Ixobrychus minutus, Larus argentatus, Larus ridibundus, Larus minutus, Nycticorax nycticorax, Ficedula parva, Pica pica, Rallus aquaticus, Sterna hirundo, Turdus merula.*
- 4 species protected by GEO 57 / 2007 (approved and amended by Law 49 / 2011): 2 under Annex 3 and 2 under Annex 4A, namely 1 reptile *(Natrix tessellata*), 1 insect (*Lucanus cervus*), 2 amphibians *(Bombina bombina, Rana dalmatina*)
- 26 plant species protected by the IUCN RED LIST, namely *Carex pseudocyperus, Carex riparia, Ceratophyllum demersum, Equisetum palustre, Hydrocharis morsus-ranae, Iris pseudacorus, Lemna minor, Lemna trisulca, Lycopus europaeus, Lysimachia nummularia, Lythrum salicaria, Myriophyllum spicatum, Nuphar luteum, Nymphaea alba, Persicaria amphibia, Persicaria lapathifolia, Ranunculus repens, Ranunculus sceleratus, Rorippa amphibia, Rumex hydrolapathum, Salvinia natans, Spirodela polyrrhiza, Typha angustifolia, Typha latifolia, Urtica kioviensis, Vallisneria spiralis.*

The Management Plan of the Protected Natural Area Snagov Lake was approved by the Order of the Minister of Environment, Water and Forests no. 652/31 March 2016, published in the Official Gazette no. 380 bis/18 May 2016.

3. The Scroviștea Nature Protected Area (declared by GD no. 792/1990) overlaps with the Scroviștea ROSCI and ROSPA Natura 2000 site.

The Scroviștea Natura 2000 site includes the following flora and fauna species of biological importance: *Quercus robur, Tillia tomentosa, Carpinus betulus, Fraxinus excelsior, Crataegus monogyna, Polygonatum latifolium, Branchypodium sylvaticum, Euphorbia amygdaloides, Lamiastrum galeobdolon, Lamiastrum galeobdolon, Carex pilosa, Dactylus glomerata, Lathyrus niger, Ligustrum vulgare, Ligustrum vulgare, Asarum europaeum, Melica uniflora, Nymphaea alba, Galanthus nivali, Sciurus vulgaris, Trapă natas, Nuphar luteum, Potomogeton natans, Crocus heuffelianus, Helix pomatia, Hirudo medicinalis, Capreolus capreolus, Lepus europaeus.*

Protected natural area of Community interest:

1. *ROSPA0140 Scroviștea,* declared by GD 971/2011, amending GD 1284/2007 on the declaration of special protection areas for birds as an integral part of the Natura 2000 European ecological network, has an area of 3356 ha and is located in the territory of Ciolpani (26%), Periş (29%), Snagov (<1%). The site comprises the north-eastern part of the valley of Sticlăriei and the Scrovistea Lake up to Piscu. It also includes forests: Ciolpani, Cocioc and Clogila.

The Scoviștea site is important for the populations of waterbird species of conservation interest such as: squacco heron - *Ardeola ralloides*, ferruginous duck - *Aythya nyroca*, Egretta garzetta - *Egretta garzetta*, little bittern - *Ixobrychus minutus*, black-crowned night heron - *Nycticorax nycticorax* and pygmy cormorant - *Phalacrocorax pygmeus*. The forest area is also important for the nesting populations of levant sparrowhawk - *Accipiter brevipes*, middle spotted woodpecker - *Dendrocopos medius*, syrian woodpecker - *Dendrocopos syriacus* and barred warbler - *Sylvia nisoria*.

2. ROSCI0224 Scroviștea, declared by Order 1964/2007 establishing a protected natural area regime for sites of Community importance, as an integral part of the European ecological network Natura 2000 in Romania, as subsequently amended and supplemented, which became special conservation area ROSAC 0224, declared by GD 685/2022 establishing a protected natural area regime and declaring special conservation areas as an integral part of the Natura 2000 European ecological network in Romania.

The protected natural area has an area of 3391 ha and is located on the territory of Ciolpani (27%), Periș (29%), Snagov (<1%) and is managed by the National Agency for Protected Natural Areas.

Scroviștea area has species of flora and fauna of great biological importance*(Quercus robur, tillia tomentosa, Carpenus betulus, Fraxinus excelsior, Nyphaea alba, Galanthus nivali, Sciurus vulgaris, Capreolus capreolus).*

Habitats identified in the Scroviștea area are:

- aquatic:

- Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation
- Dystrophic lakes and ponds

- forest:

- Dacian oak and hornbeam forests
- White willow and white poplar gallery forests.

These natural habitats are home to animal and plant species, which are also valuable species of Community interest. Some of the most important among these are: European pond turtle (*Emys orbicularis*), Great Crested Newt (*Triturus cristatus*), European fire-bellied toad *(Bombina bombina)*, common spadefoot *(Pelobates fuscus),* European bitterling *(Rhodeus amarus*)*,* European weatherfish *(Misgurnus fossilis),* crucian carp *(Carassius carassius)*, Stag beetle (*Lucanus cervus*), great capricorn beetle *(Cerambyx cerdo).*

In addition to these, there are numerous species of marsh and woodland birds, such as the squacco heron *(Ardeola ralloides)*, ferruginous duck *(Aythya nyroca*), black-crowned night heron *(Nycticorax nycticorax*), little egret *(Egretta garzetta*), whooper swan *(Cygnus cygnus*), pygmy cormorant *(Phalacrocorax pygmeus*), speckled crested *(Porzana porzana*), little crake *(Porzana parva*), Syrian woodpecker (*Dendrocopos syriacus*), Levant sparrowhawk (*Accipiter brevipes*), little bittern (*Ixobrychus minutus*), purple heron (*Ardea purpurea*), barred warbler (*Sylvia nisoria*), middle spotted woodpecker (*Dendrocopos medius*), Eurasian golden oriole.

The forests in the Scroviștea area are part of the remnants of the Vlăsiei Codras that once covered the Romanian Plain. The area is well preserved, with a mosaic of habitats (woodland, aquatic and grassland).

The Natura 2000 sites Scoviștea ROSCI became ROSAC and ROSPA have a management plan, which was approved by Order of the Minister of Environment, Water and Forests no. 787/25 April 2016.

3. ROSPA0122 Cernica Lake and Forest, declared by GD 971/2011, amending GD 1284/2007 on the declaration of special protection areas for birds as an integral part of the Natura 2000 European ecological network in Romania, with an area of 3744 ha, located in the territory of Brănești (4%), Cernica (5%), Găneasa (<1%), Pantelimon (48%).

The Cernica Lake area is characterised by southern (Mediterranean) coppice forests, which have become increasingly scarce due to logging. The fixed and free reed-covered areas, as well as the associated forest, make this area an ornithological site of particular value for the Romanian Plain.

118 bird species have been recorded in this area, some of which are listed in the Birds Directive, the rest having a legally protected status (by law and/or protected by other international conventions and agreements). There are only a few bird species that have no legally protected status. In addition, there are other protected wildlife species that are also listed under the Habitats Directive.

The Natura 2000 site ROSPA0122 Cernica Lake and Forest was established on the basis of the existence of 12 bird species, of which 10 are bird species listed in Annex I of the Birds Directive and two regularly migratory bird species not listed in Annex I of the Birds Directive.

4. ROSCI0308 Cernica Lake and Forest declared by Order 2387/2011, amending Order 1964/2007 establishing the area regime, with an area of 3267 ha, located in the territory of Brănești (5%), Cernica (5%), Găneasa (<1%), Pantelimon (41%). The Cernica Lake and Forest site is important for its habitat of Pannonian-Balkanic turkey oak - sessile oak forests, which accounts for more than 40% of the site area.

The perimeters of the two Natura 2000 sites Cernica Lake and Cernica Forest (SCI and SPA) start from the corner of Cernica Forest in the commune of Găneasa, are bordered on the east by the Pasărea River, on the course of which are the fishponds Găneasa, Pasarea, Cozieni, Brănești, Vadu Anei and Fundeni, and on the west by the Colentina River, where Lake Cernica is located.

The sites entirely include the Cernica Forest and the Căldăraru and Nisipiștea forest bodies and continue up to the Pasarea river, situated on the territory of Tânganu village, belonging to the Cernica commune.

The predominant habitats in the two sites are deciduous forests, followed by rivers, lakes and agricultural crops (arable land).

In addition to the species identified from the studies carried out in the Cernica area, in the Cernica Monastery complex there are two centuries-old Quercus robur trees declared monuments of nature by the Commission for the Protection of Monuments of Nature of the Romanian Academy.

The Natura 2000 sites Cernica Lake and Forest ROSCI and ROSPA do not have a Management Plan.

5. ROSPA0044 Grădiștea - Căldărușani - Dridu declared by GD 1284/2007 on the declaration of special protection areas for birds, as an integral part of the Natura 2000 European ecological network in Romania, with an area of 6442 ha, on the territory of Gruiu (40%); Grădiștea (19%), Moara Vlăsiei (12%), Nuci (21%), Snagov (<1%).

The Căldărușani area represents a mosaic of habitats (aquatic, forest and grassland), relatively isolated from anthropogenic pressure. The natural habitats occupied by the species for which the site has been designated are those near the lakes Căldărușani, Dridu and Balta Neagra: reedbeds, canebeds, marshes, trees on the edge of the lakes (willows, alders), water body and agricultural land.

Bird species for which the protected area has been declared a Natura 2000 Site: *Himantopus himantopus* – black-winged stilt, *Ixobrychus minutus* – little bittern, *Mergus albellus* – smew, *Nycticorax nycticorax* – black-crowned night heron, *Phalacrocorax pygmeus* – pygmy cormorant, *Philomachus pugnax* – ruff, *Porzana parva* – little crake, *Recurvirostra avosetta* – avocet, *Sterna hirundo* – common tern, *Tringa glareola* – wood sandpiper *Ardeola ralloides* – squacco heron, *Botaurus stellaris* – Eurasian bittern, *Chlidonias niger* – black tern, *Ciconia ciconia* – white stork, *Circus aeruginosus* – Western marsh harrier, *Cygnus cygnus* - whooper swan, *Egretta alba* – great egret, *Egretta garzetta* - small egret, *Aythya nyroca* – ferruginous duck.

The Natura 2000 site Grădiștea - Căldărușani - Dridu has a management plan which was approved by

the Order of the Minister of Environment, Waters and Forests no. 872/10 May 2016, published in the Official Gazette no. 472/24 June 2016, part I.

➢ Giurgiu County

In order to ensure special measures for the protection and conservation of habitats, species of wild flora and fauna, the following categories of protected natural areas have been established on the territory of Giurgiu County:

- protected natural areas of national interest;
- protected natural areas of international interest;
- protected natural areas of Community interest.

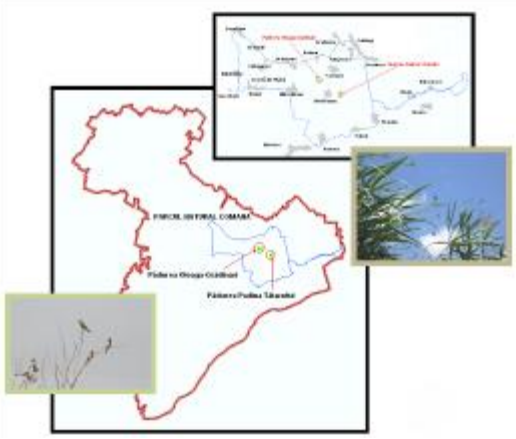
The following protected natural areas of national interest have been designated in Giurgiu County since 2000[15]:

- the following nature reserves have been declared by the Law no. 5/2000 *on National Spatial Planning, section III, protected areas:*
  - Oloaga Grădinari Forest,
  - Padina Tătarului Forest,
  - Manafu Forest,
  - Teșila Reserve.
- Government Decision No 2151/2004 *establishing the regime of protected natural area for new areas* established:
  - Comana Nature Park (Oloaga Grădinari Forest and Padina Tătarului Forest Reserves are included within the boundaries of Comana Nature Park).
- Government Decision No 1143/2007 *establishing new protected natural areas* declared
  - Cama - Dinu - Păsărica Nature Reserve.

Comana Nature Park

It covers an area of 24 963 ha and is situated entirely within the administrative territory of Giurgiu County. It was designated as a natural park by the GD no. 2151/2004. The Oloaga-Grădinari Forest and Padina Tătarului Forest Reserves (declared by Law no. 5/06 March 2000) completely overlap with the Comana Nature Park.

Comana Nature Park has been recognised as a Ramsar site by the International Ramsar Wetlands Organisation since October 2011, and by GEO no. 49/2016 amending Law no. 5/2000 on the approval of the National Territory Zoning Plan - Section III - protected areas, it was also declared by national legislation as a wetland of international importance - Ramsar Site, code RORMS0008 Comana. Romania joined the Ramsar Convention in 1991. Comana Natural Park was classified as such due to its natural richness.

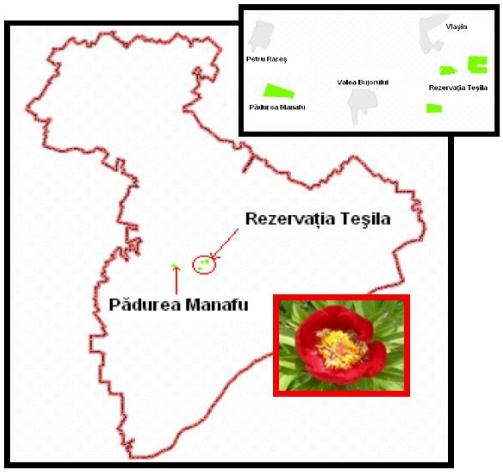


Oloaga-Grădinari Forest is a nature reserve located in the commune of Comana and has an area of 248 ha. The conservation target of this reserve is the species *Ruscus aculeatus* (butcher's broom).

Padina Tătarului Forest is a nature reserve for the protection of the species *Paeonia peregrina romanica* (Romanian peony). It is located on the administrative territory of Comana commune. The area spreads over 230 ha.

[15] https://apmgr.anpm.ro/rapoarte-anuale1

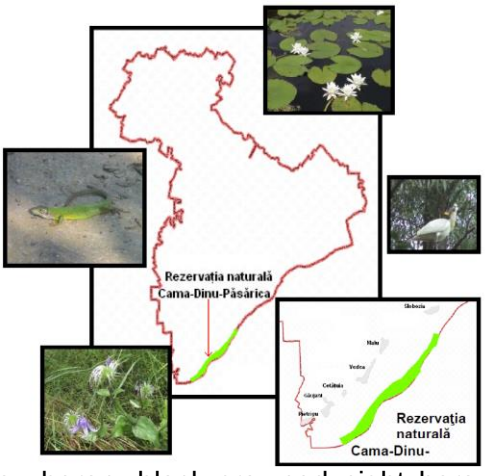
Manafu Forest Reserve is located on the territory of Ghimpați, it was declared a protected natural area by Law no. 5/2000. It covers an area of 28 ha and is a reserve for the protection of the Romanian peony - *Paeonia peregrina var. romanica*.



Teșila Reserve is located in the commune of Schitu, village Vlașin, has an area of 52.2 ha. The Teșila Forest is also a reserve for the protection of the Romanian peony - *Paeonia peregrina var. romanica* and was declared a reserve by Law no. 5/2000.

Cama Dinu Păsărica Nature Reserve covers an area of 2 400 ha and was declared as a nature reserve by GD 1143/2007. It is a protected natural area of national interest that totally overlaps with the protected natural areas of Community interest ROSPA0108 Vedea-Danube and ROSCI0088 Gura Vedei-Saica-Slobozia.

This area is a typical example of floodplain meadow, with black walnut and honey locusts plantations, wild vine and hop hedgerows, ancient oak forests with elm, black poplar and occasional ash, willow thickets and native aspen.



in addition to the characteristic wetland species, there are many plants in the grass layer, with some rare species such as the summer snowflake, white water lily, white waterlily, common bladderwort and European birthwort. The latter is found on the edge of the forest, in lower, sandier and drier places.

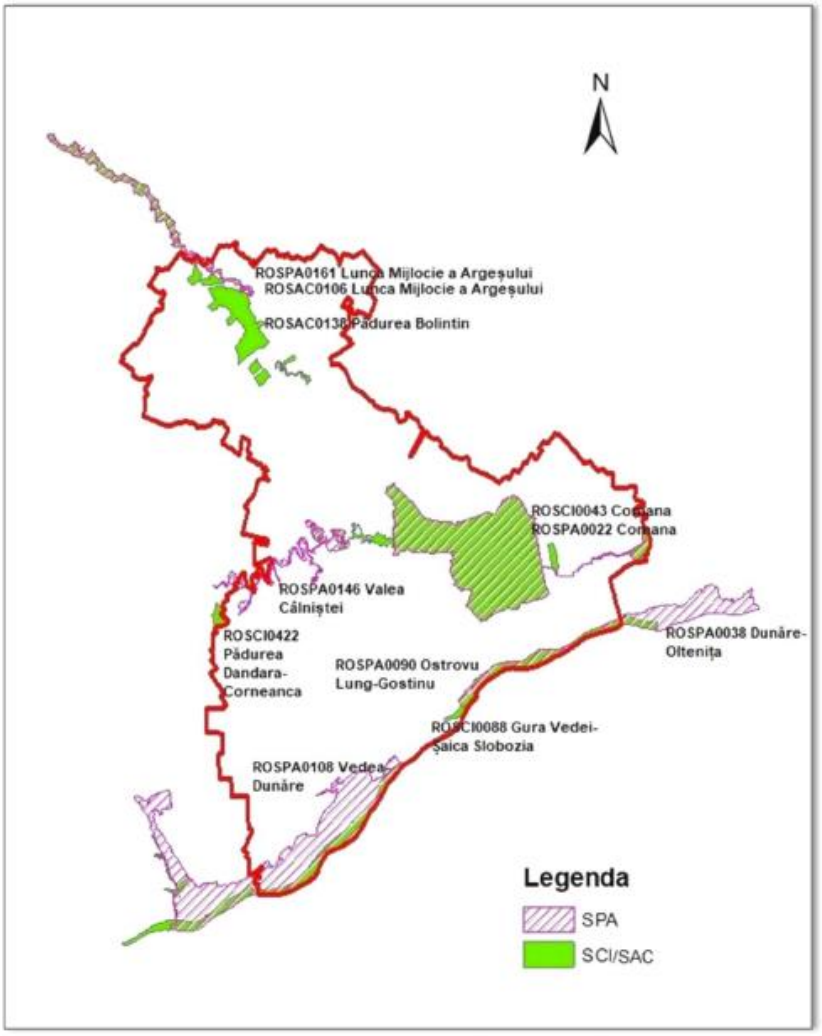
Also, the Cama-Dinu-Păsărica nature reserve is home to the largest colony of spoonbills and great cormorants in the county. Other bird populations include the squacco heron, grey heron, black-crowned night heron, small egret, great egret, etc.

The table below gives details on the area and location of the protected natural areas of community interest in Giurgiu County:

No.	Area type	Area code	SCI/SPA/SAC name	Localities in Giurgiu county	Area (ha)	County
1.	SCI	ROSCI0088	Gura Vedei – Şaica - Slobozia	Giurgiu, Gostinu, Găujani, Malu, Oinacu, Prundu, Slobozia, Vedea	10137	TR, GR, CL
2.		ROSCI0043	Comana	Băneasa, Comana, Călugăreni, Ghimpaţi, Gostinari, Greaca, Hotarele, Isvoarele, Mihai Bravu, Prundu, Schitu, Singureni, Stoeneşti	26579	GR
3.		ROSCI0422	Dandara Forest - Corneanca	Toporu	546	TR, GR
4.	SAC	ROSAC0138	Bolintin Forest	Bolintin Vale, Bucşani, Crevedia Mare, Grădinari, Găiseni, Ogrezeni, Vânătorii Mici	5637	GR
5.		ROSAC0106	Argeş Middle Meadow	Floreşti - Stoeneşti, Găiseni, Vânătorii Mici	3648	DB, GR

No.	Area type	Area code	SCI/SPA/SAC name	Localities in Giurgiu county	Area (ha)	County
6.	SPA	ROSPA0022	Comana	Băneasa, Călugăreni, Colibaşi, Comana, Gostinari, Greaca, Hotarele, Isvoarele, Mihai Bravu, Prundu, Singureni	24 982	GR
7.		ROSPA0038	Dunăre – Olteniţa	Prundu	5 927	CL, GR
8.		ROSPA0090	Ostrovu Lung-Gostinu	Gostinu, Oinacu, Prundu	2 544	GR
9.		ROSPA0108	Vedea-Danube	Găujani, Giurgiu, Malu, Slobozia, Vedea	22 404	TR, GR
10.		ROSPA0146	Câlniştei Valley	Ghimpaţi, Izvoarele, Răsuceni, Schitu	2 574	TR, GR
11.		ROSPA0161	Argeş Middle Meadow	Floreşti - Stoeneşti, Găiseni, Vânătorii Mici	3648	DB, GR

The following map shows the distribution of protected natural areas of community interest in Giurgiu County.



The project will cross 3 protected natural areas of Community importance (PNACIs):

1. ROSAC0043 Comana;
2. ROSPA0022 Comana;
3. ROSPA0038 Danube-Oltenița.

These sites are described below.

ROSAC0043 Comana

The area ROSAC0043 Comana (fig. 50) was declared a Site of Community Importance by Order No 1964/2007 establishing a protected natural area regime for sites of Community importance, as an integral part of the Natura 2000 European Ecological Network and covers an area of 26579.20 hectares. The site coordinates are: 26.103089 longitude and 44.141592 latitude.

The site falls within the Continental biogeographic region (100%).

The Comana area is part of the central subdivision of the Romanian Plain, also known as the Teleorman Plain, a high, fragmented, tabular plain, created by lacustrine, fluvio-lacustrine and loess-covered accumulations. Due to the rich diversity of the microrelief and the presence of abundant springs and streams in a dry, temperate-continental climate, this area is home to numerous habitats that support a large number of plant and animal species. The main habitats in the Comana area are grasslands, forests and wetlands and freshwater habitats.

The forest bodies in the Comana area form a wooded massif porting a number of typical woody species, such as: the Greyish oak, the downy oak, Turkey oak, the Hungarian oak, the lime, the downy ash, the hornbeam, the elm, the field maple, the Tatarian maple, etc. At the edges of these forests there are fragments of xeric grassland. At the same time, in the Comana area there are well represented humid meadows along the rivers and ponds, as well as salt meadows that in summer can take the appearance of fields with efflorescence.

Remarkable for the flora of the Comana forests is the fact that it gathers species from very different zones and vegetation stages and with a particular ecology, along with deciduous species typical of lowland and forest-steppe forests.

The Comana Pond comprises freshwater habitats, currently having the appearance of a delta with pools, ponds, inlets, sand banks with abundant reed vegetation. These habitats are a favourable habitat for many bird species, especially Anseriformes.

The main habitat types identified in the area are: continental freshwaters (standing, flowing) - 1.24, marshes (belt vegetation), swamps, moorland - 2.73%, other land (including urban, rural, roads, storage platforms, mines, industrial areas) - 6.26%, dry grassland, steppes - 2.38%, extensive cereal crops (including rotational crops with tilling) - 32.46%, improved meadows - 12.57%, transitional forests (forest habitats) N26 - 0.30%, other arable land - 7.96%, deciduous forests - 31.86%, plantations of trees or woody plants (including orchards, hedgerows, vineyards, thickets) - 2.24%.



Figure no. 50 - ROSAC0043 Comana

ROSPA0022 Comana

The area ROSPA0022 Comana (Fig. 51) was designated as a bird protection site by Government Decision No 1284/2007 on the declaration of special protection areas as part of the Natura 2000 European ecological network, and covers an area of 24982 hectares. The site coordinates are: 23.112758 longitude and 44.140703 latitude.

The site falls within the Continental biogeographic region (100%).

This site is home to important flocks of protected bird species. According to the data, there are the following categories:

a) number of species under Annex 1 of the Birds Directive: 46
b) number of migratory species listed in the Annexes to the Convention on Migratory Species (Bonn) 122
c) number of globally endangered species: 6.

The site is important for nesting populations of the following species: *Ixobrychus minutus, Nycticorax nycticorax, Ardea purpurea, Aythya nyroca, Porzana porzana, Porzana parva, Chlidonias hybridus.* The site is important during migration for the species: *Himantopus himantopus, Recurvirostra avoseta, Philomachus pugnax, Tringa glareola chire, chirighite*. The site is important for overwintering ducks. The site is home to more than 20,000 migratory shorebirds and is a possible candidate as a RAMSAR site.

The main habitat types identified in the area are: continental freshwaters (standing, flowing) - 1.32, marshes (belt vegetation), swamps, moorland - 2.68%, other land (including urban, rural, roads, storage platforms, mines, industrial areas) - 6.61%, dry grassland, steppes - 2.53%, extensive cereal crops (including rotational crops with tilling) - 34.28%, improved meadows - 9.65%, transitional forests (forest habitats) N26 - 0.32%, other arable land - 7.78%, deciduous forests - 32.46%, plantations of trees or woody plants (including orchards, hedgerows, vineyards) - 2.38%.

The biological study of the Comana area has highlighted the scientific importance of numerous natural habitats (forests and meadows) typical for the southern lowland area with strong specific, sometimes even unique, characters, identified in a natural structure close to optimal, alternating with wetlands, agricultural, rural settlements where traditional economic activities are carried out.

It is a passage area for migratory birds, and also home to many forest bird species.

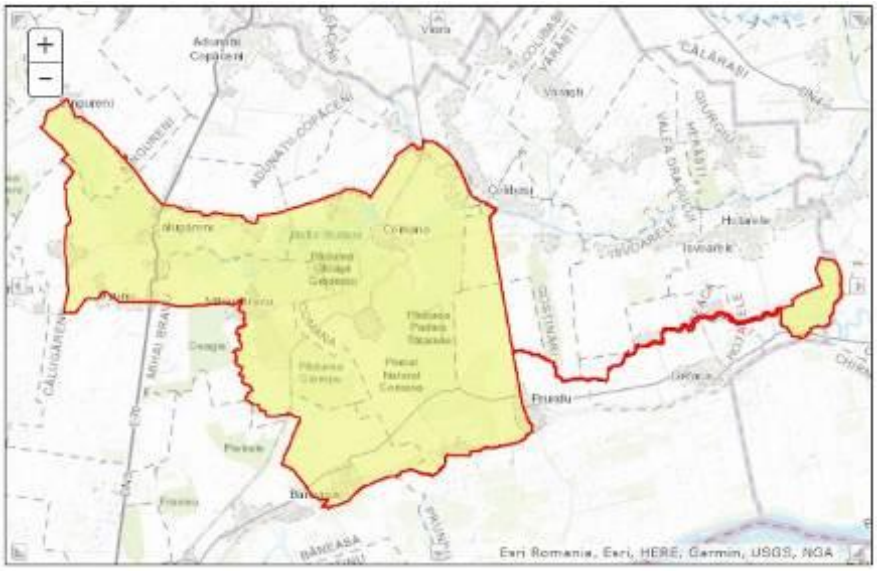


Figure no. 51 - ROSPA0022 Comana

ROSPA0038 Danube-Oltenița

The ROSPA0038 Danube-Oltenița site is, according to Directive 2009/147/EC, a special protection area for birds designated by Government Decision No 1284/2007 declaring special protection areas for birds as part of the Natura 2000 European ecological network in Romania, amended and supplemented by Government Decision No 971/2011, covering an area of 6022 hectares (Fig. 52).

Site ROSPA0038 Dunăre-Oltenița has been designated for the conservation of 26 bird species listed in Annex 1 of Directive 2009/147/EC of the European Parliament and of the Council of 2009 on the conservation of wild birds designated by the Government Decision 1284/2007, declaring special protection areas for birds as part of the Natura 2000 European ecological network in Romania, as amended and supplemented by Government Decision No 971/2011, as subsequently amended and supplemented.

According to the Natura 2000 Standard Data Form and the results of the assessment, the site is important for nesting populations of the following species: *Ciconia nigra, Himantopus himantopus, Ixobrychus minutus.* The site is important during migration for the species: *Ardeola ralloides, Phalacrocorax pygmaeus, Ciconia ciconia, Egretta alba, Egretta garzetta.*

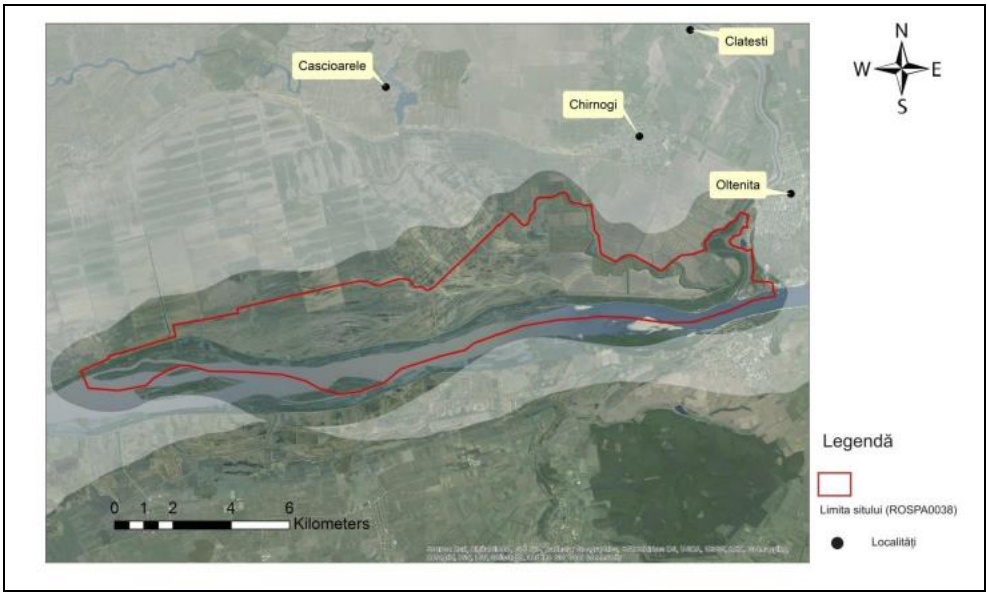


Figure no. 52 - ROSPA0038 Danube-Oltenița

- **Călărași County**

The following categories of protected natural areas have been designated in Călărași County in order to ensure special measures of protection and in situ conservation of natural heritage assets:

- of national interest
- of international interest
- of Community interest or Natura 2000 sites

Most of the protected areas, Natura 2000 sites, in Călărași County are located along the Danube and the Borcea Branch of the Danube.

The protected natural areas in Călărași County are listed in the following table[16]:

Name of the area	Area (ha)	Vegetation	Fauna
SCI - Site of Community Importance • ROSCI0022 Canaralele-Dunării (Danube limestone cliffs); • ROSCI0131 Oltenița- Mostiștea-Chiciu; • ROSCI0319 Fetești Marshes • ROSCI0343 Forests of the Mostiștei silvosteppe	**41623.0** 25943.0 11540.0 2020.0 2120.0	- lowland stands with: oak, downy oak, hornbeam, lime, ash, mahaleb cherry, etc.	- roe deer, wild boar, rabbit, fox, red deer, squirrel, wild cat, pheasant, Eurasian otter, etc.
SPA - Special protection area for birds • ROSPA0012 Borcea Arm; • ROSPA0021 Ciocănești - Danube; • ROSPA0038 Danube - Oltenița; • ROSPA0039 Danube - Ostroave; • ROSPA0051 Călărași reservoir; • ROSPA0055 Gălățui Lake; • ROSPA0105 Mostiștea Valley; • ROSPA0136 Oltenița-Ulmeni	**60990.0** 13097.0 904.0 6022.0 16224.0 5001.0 813.0 6578.0 12351.0	- pond-sedge, cane, reeds, creeping buttercup, etc.	- red-breasted goose, white-headed duck, great white pelican, whooper swan, otter, marsh frog, cormorants, herons, egrets, gulls, coots, shelducks, Eurasian otter, black-winged stilt, White-fronted Goose, white stork, spoonbill, common terns, woodcock, ziege, Danube mackerel, etc.
Important biosphere reserves and wetlands of international importance			

[16] https://calarasi.insse.ro/wp-content/uploads/2023/03/1_geografie_organiz_adm_terit_meteorologie_mediu_inconj_2023.pdf

- Wetlands of International Importance		
• EN 2111 Borcea branch • RO2114 Ostroavele Dunării-Buceac-Iortmac • RO2064 Călărași reservoir	**21529.0** **82832.0** **5001.0**	Counties: Călărași, Ialomița Counties: Călărași, Constanța Călărași county

The protected areas of national interest in Călărași County include 4 nature reserves listed in the following table[17]:

Protected area name	Code	Location	IUCN category	Type	Area (ha)	Observations
Ciocănești Reservoir	RONPA0872	Ciocănești	IV	flora and fauna	206.70	declared by GD 2151/2004
Ostrovul Haralambie	RONPA0871	Danube floodplain	IV	flora and fauna	44.90	declared by GD 2151/2004
Ostrovul Șoimul	RONPA0870	Dichiseni	IV	flora and fauna	20.10	declared by GD 2151/2004
Ciornuleasa Forest	RONPA0340	Mitreni	IV	forest	75.20	declared by Law No 5 of 6 March 2000

4.8 The landscape

The perimeter of the project to be developed is part of the landscape of heavily anthropized watercourses. Both river courses are characterised by slopes affected by erosion at the base, erosion in the bed of the Argeș River, especially in the area of the diversions from the nodes, rubbish dumps in the port of Bucharest area, works degraded by destruction, uncontrolled excavation pits left after ballast excavations, both in the riverbed and in the riparian area of the development, especially on the Argeș River, impassable access roads in certain areas.

The following is the landscape along the entire project route for the two rivers: Argeș and Dâmbovița.

➢ Argeș River

The project at km 0+000 starts in the Oltenița area (Fig. 53), at the confluence of the Argeș and Danube rivers. In this sector, the river does not form secondary branches and widens greatly. The landscape is a grassy meadow with a wooded opposite bank.



Figure no. 53 - Argeș river in the Oltenița area

[17] https://ro.wikipedia.org/wiki/Lista_rezerva%C8%9Biilor_naturale_din_jude%C8%9Bul_C%C4%83l%C4%83ra%C8%99i

In the port of Oltenița area (Fig. 54) the landscape is heavily anthropized, characterised by large areas with abundant spontaneous vegetation, abandoned buildings.



Figure no. 54 - Quay in the Oltenița area

Downstream of Oltenița, at km 2+000, the Argeș River does not form secondary branches and widens considerably. The landscape is a grassy meadow with a wooded opposite bank.





At km 6+000, upstream of the bridge over the Argeș, the river does not form secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain, partly wooded.





At km 12+000, downstream of Clătești, the Argeș river forms secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain, partly wooded.



At km 14+000, downstream of the bridge in Clătești, the Argeș river forms few secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain, partly wooded. The bridge is the first obstacle to fish migration from the Danube.





At km 16+500, opposite of Mitreni, the Argeș river forms secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain.





At km 18+000, opposite the village of Curcani, the Argeș river forms secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain, partly wooded. The island accessible during shallow waters has high biodiversity.





At km 23+000, at the bridge at Soldanu, the river does not form secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain. Near the project, the landscape is becoming anthropized.







At km 28+000, upstream the village of Negoiești, the river forms secondary branches. The valley

remains wide with relatively flat banks. Grassed flood plain, partly wooded.





At km 29+500, opposite the Budești lock, the Argeș river forms secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain, partly wooded.



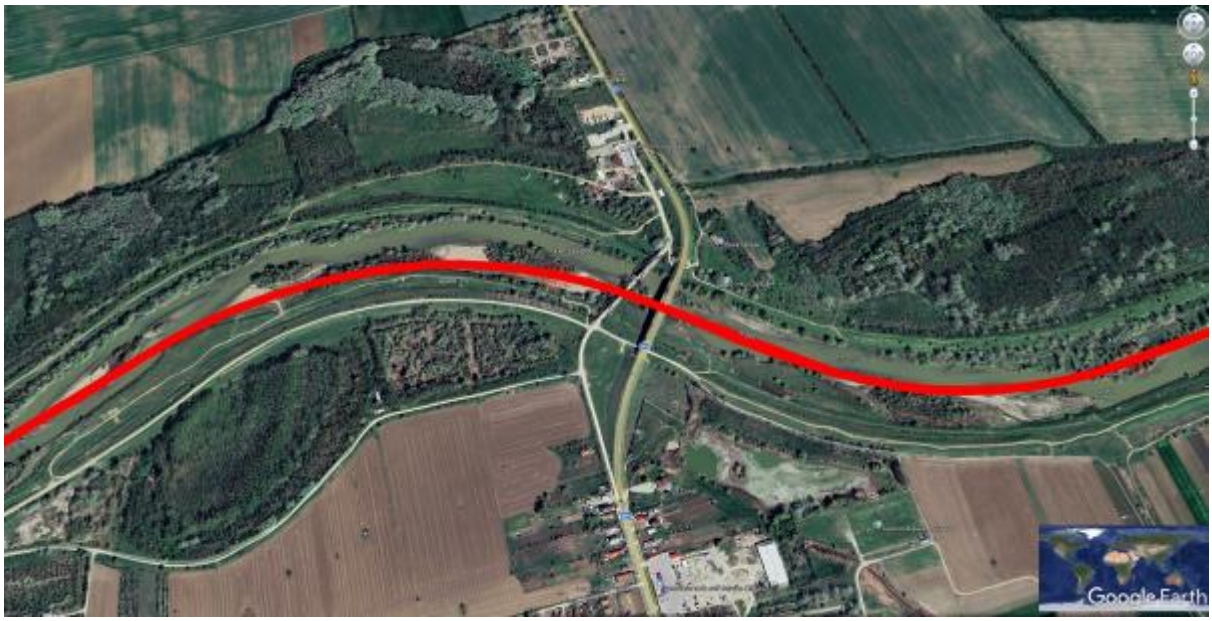




At km 38+000**,** near the village of Hotarele, the landscape is anthropized. The river forms secondary branches in this sector. The valley remains wide with relatively flat banks. Grassed flood plain, partly wooded.







At km 37+800,near the bridge over the Argeș river between the villages of Herăști and Hotarele, the river forms secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain.





At km 46+000, downstream the village of Teiușu, the Argeș river forms secondary branches. The valley is wide with relatively flat banks. A grassy, wooded flood plain on the other bank.





At km 48+500, downstream of the village of Gostinari, the river does not form secondary branches. The valley remains wide with relatively flat banks. Grassed flood plain.



At km 53+200, near the Falaștoaca lock. The river forms secondary branches in this sector. The valley remains wide with steep banks. Wooded floodplain. Landscape partly anthropized by buildings and surrounding settlements.







At km 56+500, near the railway bridge at Grădiștea, the Argeș river forms islands and secondary branches. The valley is wide with high banks. The river meadow is being severely impacted by the new railway bridge.









At km 60+000, downstream of the village of Mogoșești, the Argeș river flows on the main course, without secondary branches. Both banks become steep again, the river flows like a gorge. Wooded floodplain.

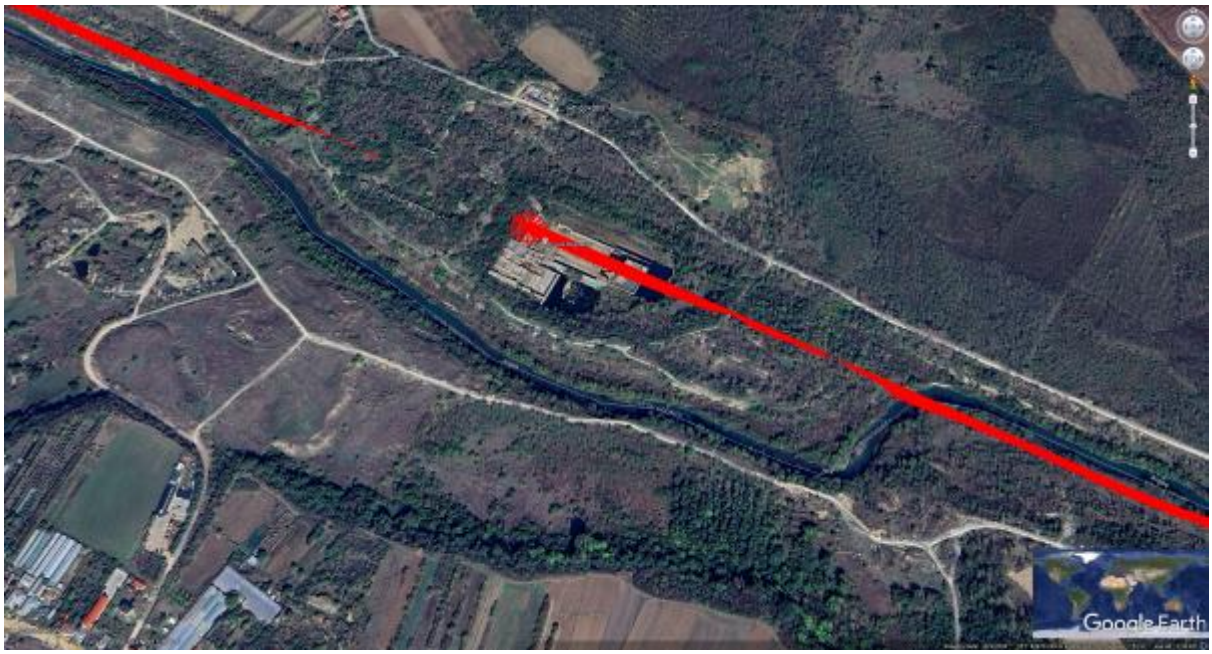


At km 63+000, opposite the Mogoșești Lock, the Argeș River flows on its main course, without secondary branches. Both banks become steep again, the river flows like a gorge. Semi-wooded

meadow with anthropized landscape.







At km 64+700, near the Varlaam lakes and the Varlaam gravel pits, the Argeș river flows on its main course, without secondary branches. Both banks become steep again, the river flows like a gorge. Semi-wooded meadow with heavily anthropized landscape.





Waste in uncontrolled landfills at km 65+404.51 can be seen in the figure below.



At kilometre 67+600 km, downstream of the road bridge over the Argeș river of the DJ 503, the river flows on the main course, without secondary branches. The banks become steep, the river flows like a gorge. Wooded meadow, hardly accessible. Large rubbish dumps on both sides of the road.









At km 68+200, just upstream of the road bridge over the Argeș river of county road DJ 503. The river flows on the main course in this section, with no secondary branches. The landscape is heavily anthropized: anthropized deforested meadow, camping and barbecue sites, presence of household waste.















At km 71+169.15, the landscape is littered with rubbish of various origins.







At km 73+578, opposite the village of Dărăști - Ilfov, the river diverges from the neighbouring road. Wild, wooded meadow. Oxbows with water all year round.



Domestic waste at km 73+323.79:




At km 76+700, opposite the village of Dumitrana, a section of the river with a relatively natural meadow, with a linear flow, without secondary branches. Narrow beach with fine sand, completely submerged in June 2023.




At km 78+000, opposite Cornetu forest, river bend with a relatively natural meadow. With secondary branches, oxbows, wooded area. Household rubbish dump, bridge broken by past floods.

View upstream and downstream of the river course (top April, middle June, bottom September):



View with adjacent wetland, with more or less water depending on the season (top April, middle June, bottom September):










Waste abandoned at km 79+896.35:





At km 82+100, immediately downstream of the dam of the Mihăilești reservoir, the area is anthropogenically impacted, the landscape is deeply modified, with areas where soil has been extracted, and which maintain water only at high river level, some adjacent to the river course, others separated from the river by dikes. Disposal of household rubbish, cartridge cases with shots.

Upstream and downstream view, wetland in the foreground, river course in the background (top April, middle June, bottom September):



View with adjacent wetland, with more or less water depending on the season (top April, middle June, bottom September):










- **Dâmbovița river**

At kilometre 1+000 km, in Budești, before the river flows into the Argeș River, the banks of the river have the most natural aspect, a natural meadow appears for the first time. The banks are straight, grassy and wooded. Major organic load.





At km 7+000, downstream of the village of Vasilați, the banks of the river have a more natural, smooth, grassy aspect. Major organic load. The landscape is partly anthropized.





At km 16+300, the Great Lake Tătaru and the tailrace, the landscape is wild, flat, surrounded by forest on 2 sides. A natural-looking and highly biodiverse tailrace. Both the lake and the tailrace represent an area of high biodiversity, compared to the Dâmbovița river, which has been greatly affected by pollution and anthropogenic interventions.



At km 19+000, downstream of Fundeni - Frunzănești, confluence with the Pasărea river. The river banks have a more natural look. They are more linear. Major organic load. Heavily anthropized landscape.







At km 22+200, near the village of Poșta, the river banks take on a more natural appearance. Steep, gorge-like banks. Major organic load. Heavily anthropized landscape.



At km 23+500, Bălăceanca dam (HN of Tânganu). The landscape is heavily anthropized, representing a small reservoir, concrete banks. There is a major anthropogenic negative impact with major organic load in the river.








Google Earth





At km 25+400, the confluence with the Colentina River, the landscape is heavily anthropized. Concrete embankments. Major anthropogenic impact. Major organic load.





At km 29+000, near the village of Glina, the landscape is heavily anthropized: concreted embankments with a major negative anthropic impact. Major organic load.



At km 30+300, Dâmbovița river at the ridge, Glina Delta, the landscape is heavily anthropized: concreted banks with a major anthropic negative impact. Major organic load.

View upstream and downstream, river course (top April, middle June, bottom September:















4.9 Social and economic environment

4.9.1. Description of the social and economic environment

The current situation of the social and economic environment in Călărași, Ilfov and Giurgiu counties is presented, the three counties host the project site, but it is worth mentioning that the implementation of the project may bring important changes in the Romanian economy, as the extended area of the country is more relevant than the strict limitation to a county.

4.9.1.1 Călărași County

Călărași county has an area of 5,087 km^2, the third largest in Romania, after Argeș (6,822 km^2) and Teleorman (5,788 km^2), occupying 14.8% of the total area of the region (34,467 km$^{2)}$. At national level, the county's surface area represents 2.1% of Romania's territory, ranking 28th in size among the country's counties.

In terms of administrative territorial organisation, the county includes 2 municipalities (Călărași and Oltenița), 3 towns (Budești, Fundulea and Lehliu Gară), 50 communes and 160 villages.

The population of Călărași County (according to the *Statistical Yearbook of Romania 2024*) is 293,080 inhabitants, of which 25,030 inhabitants live in Oltenița, 7,483 inhabitants in Budești.

Călărași county's proximity to the Danube creates a particular tourist attraction, due to the wild estuaries with deltaic flora and fauna, lakes and ponds full of fish. In addition, the county's geographical position on the border with Bulgaria and the existence of two ports on the Danube give it a particular competitive advantage.

According to the data from the *Statistical Yearbook of Călărași County*, at the level of 2022, the housing numbers by localities (for those of interest for the project) are as follows:

City	Number of existing dwellings on 31/01/2022	Of which new buildings	Private ownership	Public ownership	Population by residence	Unemployed on 31/12/2022
Budești	2860	2	2858	2	7444	369
Chirnogi	2523	4	2523	-	6802	49
Crivăț	1053	6	1052	1	1774	1
Curcani	1870	3	1870	-	5225	336
Frumușani	2633	113	2633	-	5091	181
Fundeni	2072	-	2070	2	4474	53
Gălbinași	1146	-	1144	2	3567	4
Mitreni	1672	-	1671	1	3809	96
Oltenița	10195	29	9976	219	25397	168
Plătărești	1717	6	1716	1	3209	52
Radovanu	2235	2	2235	-	3473	20
Soldanu	1389	3	1389	-	3247	101

According to the same report, at the level of each locality of interest, the resident population has also been mentioned in the above table.

In the year 2022, the total number of registered unemployed in the county was 3642 people, of which 1905 men and 1737 women. The table above shows the number of registered unemployed persons on 31 December 2022 in each locality of interest of the project, according to the county statistical yearbook.

As presented in the previous chapters, the project site will cross the following localities in Călărași County: Budești, Chirnogi, Crivăț, Curcani, Frumușani, Fundeni, Gălbinași, Mitreni, Oltenița, Plătărești, Radovanu, Soldanu.

4.9.1.2 Ilfov County

Ilfov County is located in the south-eastern part of the country, surrounding the administrative territory of Bucharest. It is the smallest county in Romania, with a surface area of 1583 km^2, occupying only 0.66% of Romania's territory.

From an administrative point of view, Ilfov County has 8 towns and 32 communes. The county's largest city is Voluntari, with a population of 42,944, spread over an area of 37.4 km^2.

In terms of the evolution of the number of inhabitants, Ilfov County showed an increase of 54.6% compared to the number recorded in 2000. At the level of localities, it can be observed that the most important population increases are in Chiajna, more precisely from 7313 persons in 2000 to 23.917 persons in 2018, which is an increase of 227%, as well as in Bragadiru, where there is an increase of 197.4% compared to 2000, in other words from 7460 persons (in 2000), in 2018 the population number is around 22190 persons.

A negative demographic evolution is highlighted in Nuci (-5.5%), 1 Decembrie (-1.7%), which show population losses of about 150 people each compared to 2000.

The population of Ilfov County (according to the *Statistical Yearbook of Romania 2024*) is 522.215 inhabitants.

According to the data from the *Statistical Yearbook of Ilfov County*, in 2022, at the level of each locality of interest, the resident population was mentioned and the resident population is presented as follows:

City	Population by residence
Vidra	8777
1 Decembrie	8432
Copăceni	2761
Dărăști	2675
Magurele	12148
Cornetu	6420
Cernica	11034
Glina	8389

According to the same report, the total number of dwellings in the county is 201,443 (of which 96,683 in urban areas), of which 1,414 are majority state-owned (790 in urban areas), 200,029 majority privately-owned (95,893 - in urban areas).

In the year 2020, the total number of registered unemployed in the county was 1441 people, of which 557 men and 884 women.

As presented in the previous chapters, the project site will cross the following localities in Ilfov County: Vidra, 1 Decembrie, Copăceni, Dărăști, Magurele, Cornetu, Cernica, Glina.

4.9.1.3 Giurgiu County

Giurgiu County is located in the southern part of Romania, on the lower course of the Danube. The area of the county is 3526 km^2, representing 1.5% of the total area of the country.

The county has 1 municipality, 2 cities and 51 communes with 167 villages.

Giurgiu is in the south of the county, Bolintin Vale in the north of the county, Adunații Copăceni in the centre - north. The proximity of the Danube (in the south) and the port area have allowed the establishment of a free commercial zone of about 160 ha and the proximity to the A1 motorway is becoming an attractive element for investors, as evidenced by the recent plans for a logistic hub of a large company on an area of 60 ha.

According to the *Statistical Yearbook of Giurgiu County*, the total number of dwellings in the county in 2021 is 122,776, of which 774 are mostly state-owned, 122,002 mostly privately owned.

The population of the county of Giurgiu (according to the *Statistical Yearbook of Romania 2024*) is 258,236 inhabitants, of which 7,405 inhabitants live in the town of Adunații Copăceni.

According to the data from the *Statistical Yearbook of Giurgiu County*, in 2022, the population in the areas of interest for the project is as follows:

City	Population by residence
Adunații Copăceni	6040
Colibași	2999
Comana	6238
Gostinari	2257
Isvoarele	1365
Herăști	2050
Hotarele	3157
Mihăilești	7305
Valea Dragului	2613

On the whole, however, the county still suffers from an acute shortage of labour and a low level of

education.

In the year 2021, the total number of registered unemployed in the county was 1979 people, of which 952 men and 1027 women.

As presented in previous chapters, the project site will intersect the following localities in Giurgiu County: Adunații Copăceni, Colibași, Comana, Gostinari, Isvoarele, Colibași, Hotarele, Adunații, Valea Dragului.

4.9.2. Health infrastructure

4.9.2.1 Health infrastructure in Ilfov County

At the county level, the network of health facilities consisted mainly of 392 medical practices, 235 dental practices, 181 pharmacies and pharmaceutical outlets, 174 family doctor practices, 49 test laboratories, 18 medical practices and 9 hospitals.

According to data from the County Statistical Yearbook, in 2020 the total number of registered persons injured at work was 98 persons, of which:

- Temporary incapacity for work - 96 persons
- Death - 2 persons
- Collective accidents at work - 3 persons
- Deaths in collective accidents at work - 1 person.

The rate of accidents at work was 0.59% down on previous years.

4.9.2.2 Health infrastructure in Giurgiu County

At the county level, the network of health facilities consisted mainly of 4 hospitals (3 in public ownership and one in private ownership), 2 outpatient clinics integrated with hospitals, 3 day hospitals, 1 medical-social establishment, 1 specialised medical centre, 1 dialysis centre, 1 general medicine practice, 30 specialist medical practices, 4 other types of medical practices.

According to data from the County Statistical Yearbook, in 2021 the total number of registered persons injured at work was 9 persons, of which:

temporary incapacity for work - 9 persons.

The rate of accidents at work was 0.24% down on previous years.

4.9.2.3 Health infrastructure in Călărași county

At the county level, the network of health facilities included mainly 5 hospitals with integrated outpatient clinics and a total of 1,167 beds, 3 day hospitals, 2 forensic medical units, 3 specialist medical centres, 2 of which with hospital beds, 1 local unit of a dialysis centre.

In the last 10 years, the private health network has developed and in the last 5 years, the number of health centres in schools in the public sector has increased, while the number of healthcare units (23 practices), pharmacies (12) and medical laboratories (3) in the private sector has increased.

The number of reported beds per 1,000 inhabitants was 4.1, which places Călărași County among the counties with the lowest values at national level (with the lowest number of beds being recorded in Ilfov County: 2.9 beds per 1,000 inhabitants. Lower values are also found in the counties of Ialomița (3.3 beds per 1,000 inhabitants) and Giurgiu (3 beds per 1,000 inhabitants) and Vrancea county also registers 4.1 beds per 1,000 inhabitants. In line with the commitments made to international organisations (World Bank) on health reform measures, the Romanian Government has committed to ensure the financing of 4.5 beds for acute illnesses in the public system per 1,000 inhabitants by 2020.

In recent years, there has been a slight decrease in the number of inhabitants returning to a doctor, both in the public and private sector, but this is correlated with the decrease in population, as the number of doctors has remained relatively constant.

According to the data from the Statistical Yearbook of Călărași County, the number of medical units in 2022 is as follows:

- hospital - 6
- day hospitals - 3
- medical practices in schools - 16
- medical practices of family doctors - 120
- medical practices of general practitioners - 16
- other types of medical practices - 2
- medical - social establishments - 2
- specialist medical centres with hospital beds - 1.

4.9.3. Risk factors for human health, including environmental risk factors

The main environmental risk factors for population and human health are air quality/air pollution, quality and quantity of drinking water, bathing water, soil, waste, noise, genetically modified organisms in food, non-ionising radiation and ionising radiation. In recent years, the effects of climate change have also increased in importance.

Construction sites involve more risks for the workers who work there than many other work environments. Treated superficially, work tasks in this field can be even dangerous, which is why employers in this industry should pay special attention to the rules for protecting the health and safety at work of their employees

For example, draughts, loud noise, poor lighting and working temperatures are some of the factors that can contribute to construction workers' poor health.

In order to protect against risk factors, construction workers are obliged to wear appropriate protective equipment consisting of: hats or helmets, sunglasses or goggles to protect them against very bright light, boots, gloves and other specific items that minimise the impact of risk factors on the body. But even with proper protective equipment, construction workers are not completely safe from hazards, and are some of the workers most at risk of developing occupational diseases or being involved in accidents at work that can cost them not only their health and mobility, but even their lives.

Occupational diseases specific to work on construction sites include lower back disorders, heart disease.

❖ ***Lumbar conditions***

Many construction workers who handle heavy materials manually develop various spinal conditions over time. There are laws regarding manual handling of masses, which require the maximum load that can be handled by an employee to be adjusted according to the type of movement performed by the body, the physical constitution of the worker and even the gender of the worker. According to the law for the handling of heavy weights, in order to protect against the development of lower back disorders, construction workers should use specialised machinery and mechanised means whenever they have to perform a task involving lifting a heavy object. But even so, there are still many manual operations in the construction industry that put workers' health at risk.

❖ ***Heart disease***

Workers with heart conditions such as hypertension should be declared unfit for work at height. It is very dangerous for a person with high blood pressure to work at great heights, which is why regular medical check-ups and the check-up on recruitment are also designed to identify heart disease. Unfortunately, not all health checks are carried out with the utmost rigour, which is why many

construction workers deliberately hide the fact that they have a heart condition so that they can be hired and carry out their work like any other employee.

In order to avoid the risk of illness and/or injury to the people who will be working on the project that is the subject of this analysis, is recommended that throughout the entire period of execution of the works, the Contractor ensure that there is at least one person designated for occupational health and safety at all work sites, that there is a health and safety plan in place, and that the personnel be trained on a health and safety plan and that all occupational risks that may exist on site be identified and all necessary measures be proposed to prevent and reduce these risks. Also the personnel who will carry out their activities must be periodically trained in accordance with the legal provisions in force on health and safety at work.

4.10 Cultural heritage

In chapter *2.2.5 Location of the project in relation to inhabited areas, historical monuments, UNESCO sites* and in Annex no. 5 of this report the archaeological sites identified in the project area have been described.

5. Description of environmental factors likely to be affected by the project

5.1 Environmental factor water

Significant impairment of water resources would mean one of the following:

- the quantitative or qualitative affectation of health protection zones
- changes in quantity and quality leading to deterioration of the quality of surface and/or groundwater bodies
- changes in quantity and/or quality that would prevent the improvement of surface and/or groundwater body water quality (achievement of the environmental objectives formulated at basin level).

A comprehensive assessment of the project's impact, in terms of wastewater management on surface water bodies into which potentially contaminated pre-treated rainwater is discharged, requires analysis not only of the impact of effluents, but also of the reduction of the current effects of the objective.

5.2 Environmental factor air

Significant disturbance of air quality would mean one of the following:

- degradation of air quality with medium and long term exceedance of the maximum permissible concentration values according to the legal requirements in force.

The areas where a significant impact is most likely to occur are those where there are already frequent exceedances of the maximum allowable concentrations for several air pollutants relevant to the proposed project.

5.3 Environmental factor soil

Significant soil and land use disturbance would involve one of the following:

- physical degradation, loss of productive capacity or soil contamination of agricultural land / gardens, etc.
- preventing any projects or activities for the rehabilitation of contaminated and/or acidified and/or salinized land.

5.4 Biodiversity

The location of the project directly targets the specific aquatic biotope of the Argeș and Dâmbovița rivers, as well as wetlands, where there are floodplain aquatic ecosystems that maintain the connection with the minor riverbeds, especially during floods.

In order to identify terrestrial biodiversity features in the project area, field investigations were carried out from April to September 2023, along the two river courses, Argeș and Dâmbovița.

These investigations aimed to identify flora, vegetation and habitats, as well as fauna in the following classes: amphibians, reptiles, birds, mammals.

Data on the hydrobiology of the two rivers in the project area were taken from the Romanian water management authority (ANAR) and Argeș-Vedea Water Basin Administration.

5.4.1. Hydrobiology

In order to characterise the biodiversity elements of the two major aquatic ecosystems in the project: the Argeș and Dâmbovița rivers, quality data of the two water bodies are needed. Figure 55 illustrates the interdependence of the quality elements of a river, which basically define the conditions for the development of all living aquatic organisms. Their presence or absence, through their characteristic elements of density, intra- and interspecific variety, population dynamics, is the result of the conditions provided by the abiotic environment of the water body. Thus, the state of ecological balance of a water body is given by the maximum value of desirable elements and the minimum or non-existent value of undesirable elements (pollutants, invasive species, parasites, etc...).

The quality characteristics of the two studied water bodies were taken from data from the Romanian water management authority (ANAR) and Argeș-Vedea Water Basin Administration (2022-2023)[18]. Thus, for the specified reporting years the situation is as follows:

1. Water body **RORW10.1_86 (Argeș: sector downstream of Mihăilești reservoir** - **upstream the confluence of Dâmbovița)** is a heavily modified water body and is 57.3 km long. It is classified under category RO10*CAPM (stretch of watercourse located in the lowland) and has as monitoring section the "Argeș-Budești" section, which has OEx(SO) and TNMN type monitoring.

Assessment of the ecological potential of the water body

In terms of biological elements (phytoplankton, macroinvertebrates and ichthyofauna) the water body was classified as having **good** ecological potential.

In terms of general physico-chemical elements, the water body has **good** ecological potential.

In terms of specific pollutants, the water body has **good** ecological potential.

According to the integrated assessment of monitored quality elements, the water body has **good** ecological potential.

Assessment of the chemical status of the water body

The chemical status assessment was carried out based on monitoring data obtained for the prioritised/priority hazardous substances identified in the water body, in the water and biota investigation environment. The water body has a **bad** chemical status, the substances that caused the non-achievement of the quality objective are: *mercury, brominated diphenyl ether (BDE) for the biota investigation medium.*

By excluding ubiquitous PBT substances, the chemical status of the water body is **good**.

[18] https://arges-vedea.rowater.ro/wp-content/uploads/2024/07/Sinteza-Calitatii-Apelor-pentru-anul-2023.pdf

2. The water body **RORW10.1_87 (Argeș: sector upstream of the confluence with Dâmbovița river** - **confluence with the Danube)** is a heavily modified water body and is 30.22 km long. It is classified as type RO11*CAPM (stretch of watercourse located in the lowland) and its monitoring section is *"Argeș-Clătești (upstream of the confluence with the Danube)",* which has OEx(SO, N, SPP), EIONET and TNMN monitoring.

Assessment of the ecological potential of the water body

In terms of biological elements (phytoplankton, macroinvertebrates and ichthyofauna) the water body was classified as having **moderate** ecological potential.

In terms of general physico-chemical elements, the water body has **moderate** ecological potential.

In terms of specific pollutants, the water body has **maximum** ecological potential.

The integrated assessment of the monitored quality elements classified the water body as having **moderate** ecological potential, with the determining elements being: ichthyofauna, total N, N-HN4, N-HN4, NNO2, total P, P-PO4.

Assessment of the chemical status of the water body

The chemical status assessment was carried out based on monitoring data obtained for the prioritised/priority hazardous substances identified in the water body, in the water and biota investigation environment. The water body has a **bad chemical status**, the substances that caused the non-achievement of the quality objective are: *mercury, brominated diphenyl ether (BDE) for the biota investigation medium.* By excluding ubiquitous PBT substances, the chemical status of the water body is **good**.

3. Water body **RORW10.1.25_B9 (Dâmbovița: control works for the discharge of Apa Nova (Glina) - confl. with Argeș river)** is a heavily modified water body with a length of 31.86 km. It is classified as type R010*CAPM (stretch of watercourse located in the lowland) and has 2 monitoring sections: *"Dâmbovița-Bălăceanca"*, which has OEx(SO,N) monitoring and *"Dâmbovița-Budești"*, with OEx(SO,N), EIONET monitoring.

Assessment of the ecological potential of the water body

In terms of biological elements (phytoplankton, ichthyofauna and macroinvertebrates) the water body was classified as having **good** ecological potential.

In terms of general physico-chemical elements, the water body has **moderate** ecological potential.

In terms of specific pollutants, the water body was classified as having **moderate** ecological potential.

According to the integrated assessment of the monitored quality elements, the water body is classified as having **moderate** ecological potential, with the determining elements being: BOD5, CCO-Cr, O diz, total N, NHN4, total P, P-PO4, detergents, phenols.

Assessment of the chemical status of the water body

The chemical status assessment was carried out based on monitoring data obtained for the prioritised/priority hazardous substances identified in the water body, in the water investigation environment. The water body has a **good chemical status.**

Thus, the Argeș and Dâmbovița river sectors in the project area have a good to moderate ecological quality.

In order to assess the ecological potential, characteristic values of 3 classes of potential *(maximum, good and moderate)* were established for heavily modified, natural heavily modified and artificial - rivers and lakes - water bodies and 5 classes of potential (maximum, good, moderate, poor and bad) for heavily modified water bodies. Reference guide values characteristic of each type were also

established, which were used to classify the ecological potential.

The biological quality elements used to assess the ecological potential of heavily modified and artificial water bodies in rivers were: phytoplankton, phytobenthos, benthic macroinvertebrates and fish fauna.

For the ***phytoplankton-based*** assessment of the status of natural surface water bodies - **rivers,** the main pressures to which phytoplankton algal communities respond were considered. Phytoplankton are sensitive to the following pressures: nutrient input, organic pollution, general degradation.

The phytobenthos (represented by diatom communities) is affected by the following types of disturbance factors: eutrophication, organic pollution, hydromorphological degradation, general degradation (non-specific stresses), alteration of bank habitat, etc. Being sensitive to several stressors, phytobenthos becomes important for the assessment of ecological potential for natural, heavily modified and artificial watercourses.

In assessing the status of natural surface water bodies - **rivers** based on ***aquatic macrophytes,*** the main pressures to which aquatic macrophyte communities respond were considered. Aquatic macrophyte species are sensitive to the following pressures: organic pollution, hydromorphological degradation, general degradation (non-specific pressures).

In assessing the ecological potential of **heavily modified and artificial** surface water bodies - **rivers** based on ***benthic macroinvertebrates,*** the main pressures to which macroinvertebrate communities respond were considered. Benthic macroinvertebrates are sensitive to the following pressures: organic pollution and general degradation.

As regards the phytoplankton and macrobenthos composition and quality data for the analysed river segments corresponding to the project route, they have been made available by the Romanian water management authority (ANAR) and are presented in the table in Annex 10 to this study.

With regard to the presence of ichthyological species, according to ANAR data (2022) on the Argeș-Budești and Argeș – Clătești sections (upstream of the conf. with the Danube), 7 fish species were identified (tab. 25). Species identified are common, of no conservation importance.

According to the bibliographical data[19], the following 14 ichthyofaunal (fish) species may be present in the Argeș river, in various segments of the river, related to the project (tab. 26), of which 3 species are sensitive (CR, V, NT) in terms of conservation status, while the other 11 are not threatened:

Table no. 25 - Fish species potentially present in the project area on the Argeș river and their protection status

Scientific name	Annex of Habitats Directive / GEO 57/2007 approved by Law No. 49/2011	EU conservation status of the species
1. *Acipenser ruthenus*	Annex V / Annex 5a	CR - Critically endangered
2. *Umbra krameri*	Annex II / Annex 3	VU - Vulnerable
3. *Gymnocephalus schraetser*	Annex II, V / Annex 3	LC - Least concern
4. *Gymnocephalus baloni*	Annex II, IV / Annex 3, 4a	LC - Least concern
5. *Zingel zingel*	Annex V / Annex 3, 4a, 5a	LC - Least concern
6. *Aspius aspius*	Annex II, V / Annex 3	LC - Least concern
7. *Barbus barbus*	Annex V / Annex 5a	LC - Least concern
8. *Barbus meridionalis*	Annex II, V / Annex 3, 5a	NT - Near threatened
9. *Gobio albipinnatus vladykovi*	Annex II / Annex 3	LC - Least concern
10. *Pelecus cultratus*	Annex II, V / Annex 3	LC - Least concern
11. *Rhodeus sericeus amarus*	Annex II / Annex 3	LC - Least concern
12. *Cobitis taenia*	Annex II / Annex 3	LC - Least concern
13. *Misgurnus fossilis*	Annex II / Annex 3	LC - Least concern
14. *Sabanejewia aurata*	Annex II / Annex 3	LC - Least concern

[19] https://www.ibiol.ro/posmediu/pdf/Ghiduri/Ghid%20de%20monitorizare%20a%20speciilor%20de%20pesti.pdf

In conclusion:

The mentioned species may be present in different segments of the Argeș River, or even punctually, e.g. at the confluence with the Danube River. However, these data, in particular the low number of fish species, confirm the poor quality of the water body and a current low potential for faunal species population in both aquatic and terrestrial riparian environments.

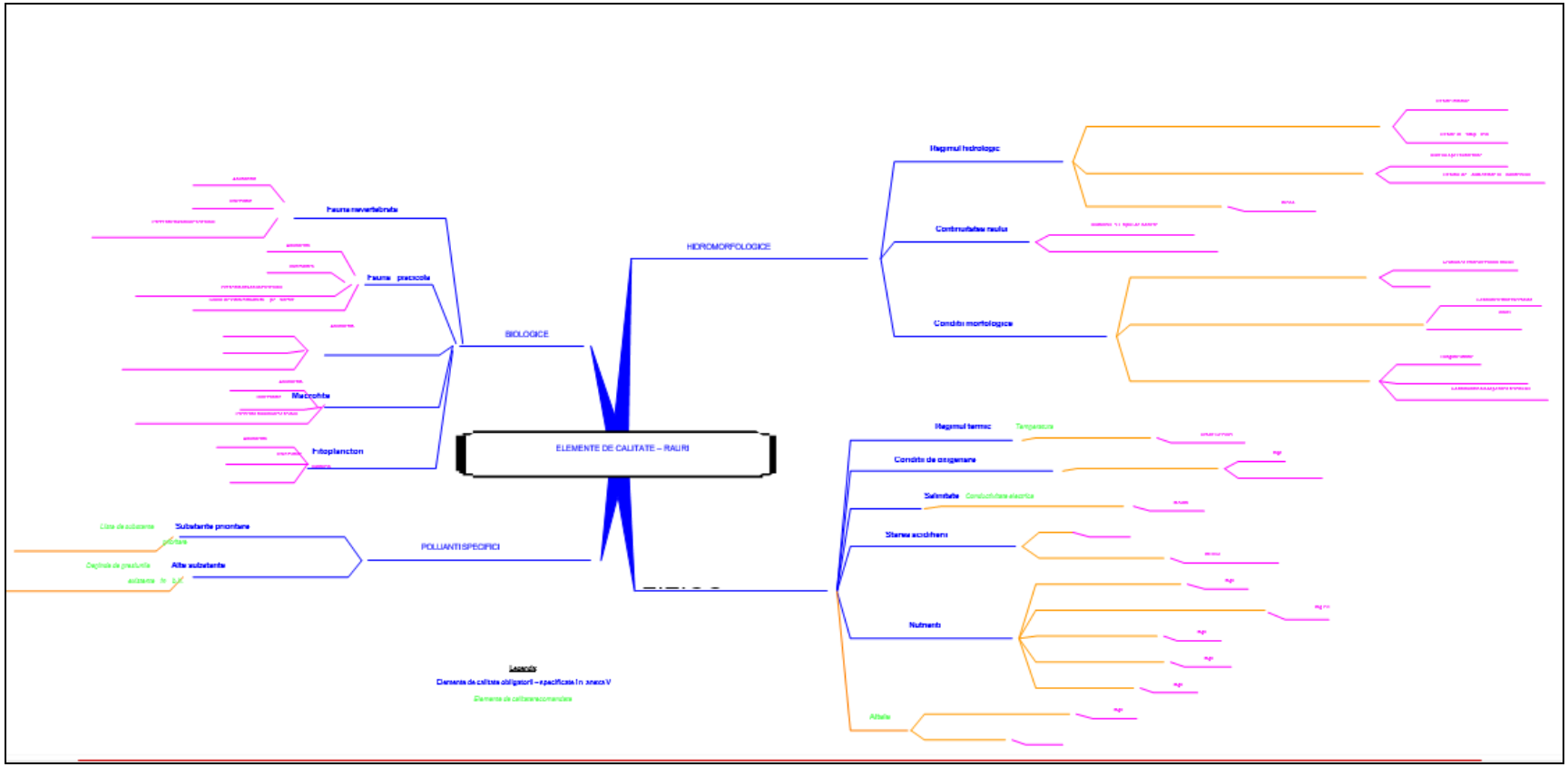


Figure no. 55 - Quality elements for rivers

Table no. 26 - Ichthyofauna identified on the Argeș river (ANAR 2022)

Section identification data						Ichthyofauna primary data				
WATER BODY CODE	**WATER BODY**	**LATITUDE**	**LONGITUDE**	**SECTION CODE**	**SECTION**	**SAMPLING DATE**	**Species name**	**No of individuals (ind. / sample)**	**Individuals <=150 mm (ind./sample)**	**Individuals > 150mm (ind. / sample)**
RORW10-1_B6	Argeș: section downstream of Adunații reservoir - upstream of the confluence with the Dâmbovița river	303911.01	616341.001	RO105800	Argeș-Budești	27/06/2022	*Alburnus alburnus*	17	17	0
RORW10-1_B6	Argeș: section downstream of Adunații reservoir - upstream of the confluence with the Dâmbovița river	303911.01	616341.001	RO105800	Argeș-Budești	27/06/2022	*Barbus barbus*	9	1	8
RORW10-1_B6	Argeș: section downstream of Adunații reservoir - upstream of the confluence with the Dâmbovița river	303911.01	616341.001	RO105800	Argeș-Budești	27/06/2022	*Gobio gobio*	18	18	0
RORW10-1_B6	Argeș: section downstream of Adunații reservoir - upstream of the confluence with the Dâmbovița river	303911.01	616341.001	RO105800	Argeș-Budești	27/06/2022	*Leuciscus cephalus*	10	10	1
RORW10-1_B7	Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the	295373.01	627672.001	RO14280	Argeș - Clatesti (upstream of the confl. with the	27/06/2022	*Alburnus alburnus*	48	48	0

	Danube				Danube)					
RORW10-1_B7	Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the Danube	295373.01	627672.001	RO14280	Argeș - Clatesti (upstream of the confl. with the Danube)	27/06/2022	*Carassius gibelio*	6	6	0
RORW10-1_B7	Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the Danube	295373.01	627672.001	RO14280	Argeș - Clatesti (upstream of the confl. with the Danube)	27/06/2022	*Leuciscus cephalus*	4	4	0
RORW10-1_B7	Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the Danube	295373.01	627672.001	RO14280	Argeș - Clatesti (upstream of the confl. with the Danube)	27/06/2022	*Perca fluviatilis*	4	4	0
RORW10-1_B7	Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the Danube	295373.01	627672.001	RO14280	Argeș - Clatesti (upstream of the confl. with the Danube)	27/06/2022	*Scardinius erythrophthalmus*	1	1	0

5.4.2. Flora, vegetation and habitats

In order to identify the flora, vegetation and habitats within the perimeter of the proposed project, the route was divided into 70 fixed vantage points (Fig. 56), and the trips were carried out at the times of maximum presence of aquatic and terrestrial plant species, i.e. **21-23 June 2023** and **20-22 September 2023.**

The sampling was similar to the one used for the assessment of the faunal populations along the Argeș and Dâmbovița rivers. We approached the methodology of **direct observations** from a fixed point (vantage point), on an area of about 100 square metres, focusing on plant species of conservation interest, with alien and invasive alien status in our country, as well as the composition of plant communities characteristic of Natura 2000 habitats.

Sampling included one data collection station each. Specimen collection and pressing was carried out in the field, and the identification of species and habitat types according to the types of associations present was carried out entirely in the laboratory.

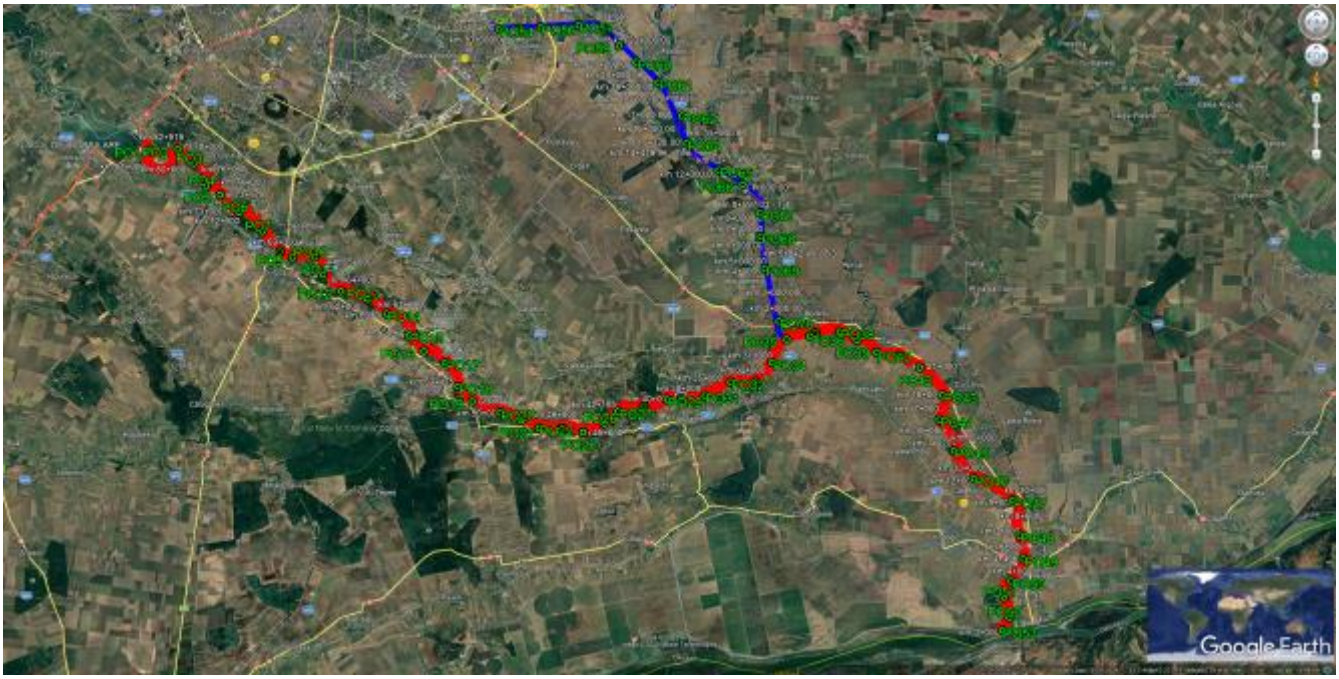


Figure no. 56 - Map of field investigations with fixed vantage points (PO1-PO70)

5.4.2.1 Argeș River

On the project route along the Argeș River (points **P01-P53**), 182 plant taxa were inventoried (tab. 26).

Among these taxa are of conservation interest in Romania, according to national Red Lists (Boșcaiu et al. 1994, Dihoru & Dihoru 1994, Oltean et al. 1994) or the National Red Book (Dihoru & Negrean 2009), there is only ***Marsilea quadrifolia,*** **which is also a Natura 2000 species, listed in the Habitats Directive. A population of this species has been observed in the area of the HN1 lock at Falaștoaca, at point 50, which is not included in a protected area of Community interest.**

The status of all the plants observed along the Argeș river, at global IUCN level, is presented in Table 26, where it can be seen that the remaining species identified have a status of least concern (LC).

32 taxa are **alien species**, with different degrees of invasiveness, according to the literature (reports of the project "Management of invasive species in Romania": https://invazive.ccmesi.ro/publicatii/,Anastasiu & Negrean, 2009, Sîrbu & Oprea, 2011, etc.). Of the alien species, **23 taxa are considered invasive or potentially invasive** in Romania, including: *Acer negundo, Ailanthus altissima, Amaranthus albus, Amaranthus retroflexus, Ambrosia artemisiifolia, Amorpha fruticosa, Artemisia annua, Bidens frondosa, Cuscuta campestris subsp. campestris, Elodea nuttallii, Erigeron annuus subsp. annuus, Erigeron canadensis, Euphorbia maculata, Fraxinus*

pennsylvanica, Gleditsia triacanthos, Humulus scandens, Ipomoea purpurea, Lemna minuta, Morus alba, Prunus cerasifera, Robinia pseudoacacia, Sorghum halepense, Xanthium spinosum, Xanthium italicum.

The full list of species inventoried, including the status of alien species, is detailed in Table 26.

Table no. 26 - Taxa inventoried on the Argeș river project route (a - allochthonous, i - invasive, pi - potentially invasive)

No.	Scientific name	Invasive status	IUCN Red List
1.	*Abutilon theophrasti*	a	
2.	*Acer campestre*		LC
3.	*Acer negundo*	i	LC
4.	*Acer tataricum*		
5.	*Achillea setacea*		
6.	*Aegilops cylindrica*		
7.	*Agrimonia eupatoria* subsp. *eupatoria*		LC
8.	*Agrostis capillaris*		
9.	*Agrostis stolonifera*		LC
10.	*Ailanthus altissima*	i	
11.	*Alcea rosea*	a	
12.	*Amaranthus albus*	i	
13.	*Amaranthus retroflexus*	i	
14.	*Ambrosia artemisiifolia*	i	
15.	*Amorpha fruticosa*	i	
16.	*Anthemis arvensis*		
17.	*Aristolochia clematitis*		
18.	*Artemisia absinthium*		LC
19.	*Artemisia annua*	i	
20.	*Artemisia austriaca*		
21.	*Artemisia campestris*		
22.	*Astragalus cicer*		LC
23.	*Astragalus glyciphylos*		
24.	*Atriplex tatarica*		
25.	*Ballota nigra* subsp. *nigra*		LC
26.	*Berteroa incana*		
27.	*Bidens frondosa*	i	LC
28.	*Bidens tripartita*		
29.	*Bolboschoenus maritimus*		
30.	*Bothriochloa ischaemum*		
31.	*Brachypodium sylvaticum*		
32.	*Bromus hordeaceus*		
33.	*Bromus sterilis*		
34.	*Bromus tectorum*		
35.	*Butomus umbellatus*		
36.	*Calamagrostis epigejos*		
37.	*Cannabis ruderalis*		
38.	*Capsella bursa - pastoris*		
39.	*Cardaria draba*		
40.	*Carduus acanthoides*		
41.	*Carduus nutans sbsp. nutans*		

42.	*Carex sp.*		
43.	*Carthamus lanatus*		
44.	*Celtis australis*		
45.	*Centaurea cyanus*	a	
46.	*Centaurea nigrescens*		
47.	*Centaurea solstitialis*	a	
48.	*Chenopodium album*		
49.	*Chondrilla juncea*		
50.	*Cichorium intybus*		LC
51.	*Cirsium arvense*		
52.	*Cirsium vulgare*		
53.	*Clematis vitalba*		
54.	*Conium maculatum*		
55.	*Convolvulus arvensis*		
56.	*Cornus mas*		LC
57.	*Cornus sanguinea*		
58.	*Crataegus monogyna*		LC
59.	*Crepis foetida* subsp. *rhoeadifolia*		
60.	*Cuscuta campestris* subsp. *campestris*	i	
61.	*Cychorium intybus*		
62.	*Cynodon dactylon*		
63.	*Cyperus sp.*		
64.	*Daucus carota*		LC
65.	*Descurainia sophia*		
66.	*Dipsacus laciniatus*		
67.	*Echinochloa crus-galli*		
68.	*Echinops sphaerocephalum*		
69.	*Echium italicum*		
70.	*Echium vulgare*		
71.	*Elaeagnus angustifolia*		
72.	*Elodea nuttallii*	i	
73.	*Elymus repens* subsp. *repens*		
74.	*Epilobium hirsutum*		
75.	*Equisetum hyemale*		LC
76.	*Equisetum palustre*		LC
77.	*Erigeron annuus* subsp. *annuus*	i	
78.	*Erigeron canadensis*	i	
79.	*Eryngium campestre*		
80.	*Euphorbia cyparissias*		
81.	*Euphorbia maculata*	i	
82.	*Festuca valesiaca*		
83.	*Filago germanica*		
84.	*Fraxinus pennsylvanica*	i	
85.	*Galium aparine*		
86.	*Galium mollugo*		
87.	*Galium verum*		
88.	*Geranium dissectum*		
89.	*Geum urbanum*		LC

90.	*Glechoma hederacea*		
91.	*Gleditsia triacanthos*	pi	LC
92.	*Hordeum murinum*		
93.	*Humulus lupulus*		LC
94.	*Humulus scandens*	pi	
95.	*Hypericum perforatum*		
96.	*Ipomoea purpurea*	pi	
97.	*Iris pseudacorus*		
98.	*Juglans regia*	a	
99.	*Lamium maculatum*		
100	*Lathyrus tuberosus*		LC
101	*Lemna minuta*	pi	LC
102	*Lemna sp.*		
103	*Lemna trisulca*		
104	*Ligustrum vulgare*		
105	*Linaria vulgaris*		
106	*Lolium perenne*		LC
107	*Lotus corniculatus*		
108	*Lycium barbarum*		
109	*Lycopus europaeus*		LC
110	*Lysimachia nummularia*		
111	*Lythrum salicaria*		
112	***Marsilea quadrifolia***	**Species N2000**	
113	*Matricaria sp.*		
114	*Medicago minima*		
115	*Medicago sativa*	a	LC
116	*Melilotus officinalis*		
117	*Mentha aquatica*		
118	*Mentha longifolia sbsp. longifolia*		LC
119	*Mentha pulegium*		LC
120	*Morus alba*	i	
121	*Morus nigra*	a	
122	*Oenothera glazioviana*		
123	*Onopordum achanthium*		
124	*Origanum vulgare*		
125	*Oxalis corniculata*		
126	*Papaver rhoeas*		LC
127	*Parthenocissus quinquefolia*		
128	*Phragmites australis*		LC
129	*Plantago arenaria*		
130	*Plantago lanceolata* subsp. *lanceolata*		LC
131	*Plantago media*		
132	*Polygonum aviculare*		LC
133	*Polygonum hydropiper*		
134	*Polygonum lapathifolium sbsp. Lapathifolium*		LC
135	*Populus alba*		LC
136	*Populus nigra*		Data deficient
137	*Potentilla reptans*		

138	*Prunus cerasifera*	pi	
139	*Robinia pseudoacacia*	i	LC
140	*Rosa canina*		LC
141	*Rubus caesius*		
142	*Salix alba*		LC
143	*Salix babylonica*	a	
144	*Salix fragilis*		LC
145	*Salix purpurea*		LC
146	*Salix triandra*		LC
147	*Salvinia natans*		
148	*Sambucus ebulus*		LC
149	*Sambucus nigra*		LC
150	*Sanguisorba minor*		
151	*Saponaria officinalis*		
152	Schoenoplectus lacustris		LC
153	*Scirpus sylvaticus*		LC
154	*Securigera varia*		LC
155	*Senecio vulgaris*		
156	*Setaria pumila*		
157	*Sorghum halepense*	i	
158	*Sparganium erectum*		
159	*Torilis arvensis* subsp. *arvensis*		
160	*Tragopogon pratensis*		
161	*Trifolium arvense*		
162	*Trifolium campestre*		
163	*Trifolium fragiferum*		
164	*Trifolium repens*		LC
165	*Tripleurospermum inodorum*		
166	*Petrorhagia prolifera*		
167	*Typha angustifolia*		
168	*Typha latifolia*		LC
169	*Ulmus minor*		Data deficient
170	*Urtica dioica* subsp. *dioica*		LC
171	*Verbascum sp.*		
172	*Verbascum speciosum*		
173	*Verbena officinallis*		LC
174	*Vicia cracca*		
175	*Viola sylvatica*		
176	*Vulpia myuros*		
177	*Xanthium italicum*	a	
178	*Xanthium spinosum*	i	
179	*Xanthium strumarium*		
180	*Xeranthemum annuum*		
181	*Xeranthemum cylindraceum*		

On the basis of the inventory prepared in the vantage points along the Argeș river, the observed vegetation indicates a diversity of communities influenced by the proximity of the water, the degree of flooding and anthropogenic activities.

The main vegetation types identified are:

1) Marsh and alluvial communities: especially along temporary or permanent floodplains, where aquatic species dominate, such as: *Phragmites australis,* Typha *angustifolia* and *Typha latifolia*. These communities are characteristic of wetland habitats and are of moderate conservation value and not protected by Natura 2000.

2) Alluvial meadow vegetation: consisting mainly of woody species such as *Salix alba* and *Populus alba*, indicating partial compatibility with Natura 2000 habitat 92A0 (*Salix alba* and *Populus alba* galleries). However, this compatibility is limited by anthropogenic disturbance, incomplete structure in characteristic species and the abundance of invasive species.

There is an abundance of invasive species along the route (Table 27), with the most aggressive being *Amorpha fruticosa,* but also other species such as: *Ailanthus altissima*, *Ambrosia artemisiifolia*, *Sorghum halepense*, *Humulus scandens,* which alter the structure of meadow communities and reduce the conservation value of these habitats. Ruderal species, adapted to disturbed soils, are common in areas exposed to anthropogenic influences.

3) Xerophytic grasslands becoming ruderal: on drier sites, such as points on high banks, the vegetation is dominated by species adapted to drought and dry soils, such as *Cynodon dactylon, Achillea setacea, and Bromus sterilis* etc. These grasslands have a pronounced ruderal character and are common in sites disturbed by human activities.

Compatibility with Natura 2000 habitat 92A0: At points such as P03, P04, P08, P09, P10, P11, P12 - P15, P25, P26, P30, P44 and P46, plant communities were found that include species compatible with Natura 2000 habitat 92A0 - *Salix alba and Populus alba galleries*. However, compatibility with this habitat is limited by:

- the often low abundance of characteristic woody species *(Salix alba and Populus alba*), which occur sporadically and do not form stable meadow forest structures;
- Invasions of alien species such as *Amorpha fruticosa*, *Ailanthus altissima*, and *Robinia pseudoacacia*, which alter vegetation structure and reduce habitat integrity;
- Anthropogenic influences evident in areas close to roads and banks, where vegetation is dominated by ruderal and invasive species, specifying disturbance and fragmentation of the meadow habitat.

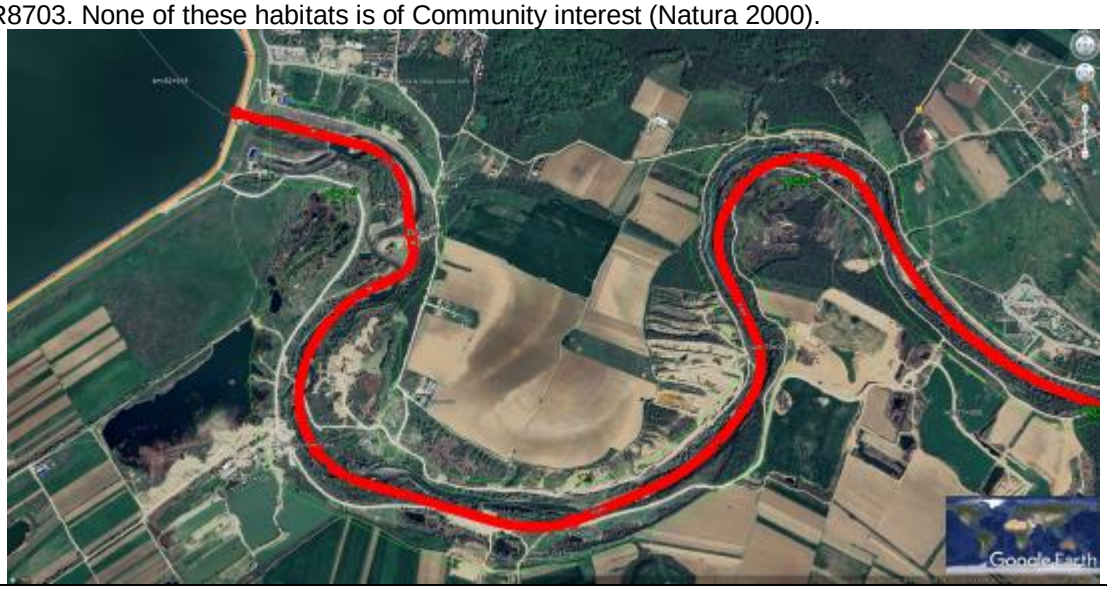
In conclusion, along the Argeș River, the vegetation reflects a mixture of marsh, alluvial and ruderal habitats, with significant influences from invasive species and human activities, which limit the full compatibility with habitat 92A0 and affect the conservation value of these riparian ecosystems.

The situation of the dominant plant communities at the monitored points is presented below (Tab. 27). The cover-abundance (CA) index comprises six point of the Braun-Blanquet scale as follows:

1) + = rare individuals with very low cover;
2) 1 = abundant but with low cover or rare but with high cover;
3) 2 = very abundant or cover of 10-25% of total plot area;
4) = 25-50% cover of total plot area, irrespective of the number of individuals;
5) = 50-75% cover of total plot area, irrespective of the number of individuals;
6) = 75-100% cover of total plot area, irrespective of the number of individuals;

Each of the six steps of the Braun-Blanquet scale corresponds to an average value of the percentage coverage, as follows (Borza Boșcaiu, 1965): 5 (87.5%), 4 (62.5%), 3 (37.5%), 2 (17.5%), 1 (5.0%), + (0.1%). Substrate cover is expressed as a percentage and indicates whether the green cover is compact or discontinuous.

Table no. 27 - Dominant plant communities in the analysed vantage points on the Argeș River

VP 1 – km 82+100	A variety of plant communities are identified at vantage point 1: - Reed communities - *Phragmites australis* (CA index: 1) are abundant, forming hygrophilous phytocenoses of the type *Scirpo-Phragmitetum*. This association is compatible with the Romanian habitat R5309, but which has no N2000 counterpart. - Invasive plant communities: *Amorpha fruticosa* (CA index: 3), *Acer negundo* (CA index: 2), and *Ailanthus altissima* (CA index: 1) are abundant describing the habitat R4423 of False indigo bush *(Amorpha fruticosa*), but these communities have a low, even negative, conservation value due to their invasive, degrading character on native biodiversity. - Ruderal and xerophytic vegetation - Ruderal associations of the *Onopordetum acanthii* type develop on the dry land between the bank and the embankment road. These include species such as *Artemisia absinthium* (CA index: 3), *Carduus nutans* (CA index: +), *Echinops sphaerocephalus* (CA index: +), and *Onopordum acanthium* (CA index: +), and are compatible with the habitat R8702, which develops on open and disturbed land and has no conservation value. - Association *Conietum maculati* - species *Conium maculatum* (CA index: 1), dominant on dry land, creates a tall vegetation community that masks other companion species such as *Convolvulus arvensis* (CA index: +) and *Descurainia sophia* (CA index: +). This association is a sign of ruderal and disturbed land, also compatible with habitat R8703, characteristic of anthropogenic areas and roadsides, and of no conservation value. Thus, the vegetation from the vantage point 1 is compatible with habitats R5309 and R4423, which are specific to meadows and marshes, but also with ruderal habitats such as R8702 and R8703. None of these habitats is of Community interest (Natura 2000). 
VP 2 - km 78+000	The following plant communities were observed at the vantage point 2: - Communities of *Phragmites australis* (CA index: 1) and *Typha angustifolia* (CA index: 2), along with other aquatic and hygrophilous plants such as *Scirpus sylvaticus* (CA index: +/1) and *Polygonum hydropiper* (CA index: 1). These species form phytocenoses compatible with the habitat R5309 (Danube community with *Phragmites australis* and *Schoenoplectus lacustris*), which is of moderate conservation value and is not recognised in the Natura 2000 network. - Alien and invasive species: *Amorpha fruticosa* (CA index: 4), *Ambrosia artemisiifolia* (CA index:+), *Bidens frondosa* and *Xanthium strumarium*, creating an invasive shrubland habitat. Invasive vegetation is characteristic of the habitat R4423 - thickets of false indigo bush *(Amorpha fruticosa*), but this habitat has a low conservation value and is considered to be ecologically degraded. - Ruderal and xerophytic vegetation is found on the drier land between the bank and the road, including species such as *Euphorbia cyparissias* (CA index: +), *Sorghum halepense* (CA index: +), *Setaria pumila* (CA index: +) and *Calamagrostis epigejos* (CA index: 3). These species are associated with the habitat R8702 - xerophytic grasslands and ruderal grasslands, which develop on open and disturbed soils. This habitat has a low conservation value and is not included in Natura 2000 sites. - Meadow-specific trees and shrubs: Species of *Salix alba* (CA index: 1), *Rubus caesius* (CA index: 1), *Populus alba* (CA index: 1) **contribute to the typical structure of the meadow habitat R4407 - Danubian forests with white willow and white poplar, equivalent to**

	Natura 2000 habitat 92A0 - Salix alba and Populus alba galleries. However, the presence and coverage of invasive species *(Amorpha fruticosa*, *Ambrosia artemisiifolia*, *Fraxinus pennsylvanica, Xanthium italiucum* etc) and ruderal-xerophytic vegetation reduces the overall conservation value of the habitat.
VP 3 and VP 4 - km 76+700 - km 75+800	The vantage points 3 and 4 have similar characteristics to each other and to point 2. The following plant communities can be described: - Communities of reed *Phragmites australis* (CA index: 1) and hygrophilous species such as *Scirpus sylvaticus* (CA index: +/1), and *Polygonum lapathifolium* (CA index: 1) suggest compatibility with habitat R5309 - Danubian communities with reed, specific for temporarily flooded wetlands. This habitat is of moderate conservation value, but has no direct counterpart in the Natura 2000 network. - Thickets of false indigo bush *Amorpha fruticosa* (CA index: 4) forming dense invasive thickets, characteristic of the habitat R4423 - Thickets of false indigo bush, which has a low conservation value and negative impact on biodiversity. - Meadow-specific trees and shrubs: woody species such as *Populus alba*(CA index: 1), *Populus nigra*(CA index: 2), *Salix alba* and *Cornus sanguinea*, **indicate a structure partially compatible with habitat R4407 - Danubian forests with white willow and white poplar, equivalent to Natura 2000 habitat 92A0 - *Salix alba* and *Populus alba* galleries** (Figures 57-58). 
VP 5 – km 73+578	The floristic composition of PO5 matches the following habitat types: - Habitat R5305 - Danube communities with *Typha angustifolia* (CA index: 1), *Typha latifolia* (CA index: 1) and *Phragmites australis* (CA index: 2), which are species specific for habitat R5305, forming the main structure of the marsh vegetation. Other species, such as *Polygonum hydropiper* and *Sparganium erectum*, support the character of this habitat, which is of moderate conservation value but is not included in the Natura 2000 network. - The presence of *Salvinia natans* (CA index: 4) and *Lemna trisulca* (CA index: 3) indicates fragments of marsh communities, but does not suggest complete compatibility with habitat R2203. This is a community without a high conservation value. - Invasive and ruderal species: *Amorpha fruticosa* (CA index: 3), *Erigeron annuus*, *Ambrosia artemisiifolia*, and *Sorghum halepense*. These plants create disturbed, ruderal communities and are specific to habitat R4423 - Invasive thickets of false indigo bush *(Amorpha fruticosa*) or open ruderal areas. Habitat R4423 has a low conservation value and is not recognised among Natura 2000 sites and is considered a sign of ecological degradation. - The species *Populus alba* and *Salix alba* are present, but in relatively low abundance (CA index: +), suggesting that they are isolated vegetation components rather than cover species in a stable forest structure. This distribution limits compatibility with the R4407 habitat *Conclusion:* Although the vantage point 5 contains species associated with habitats R2203 and R4407 - Danubian forests with white willow and white poplar, their low abundance and fragmentary presence, together with the influence of invasive and ruderal species, limits the compatibility with any habitat type of conservation value.

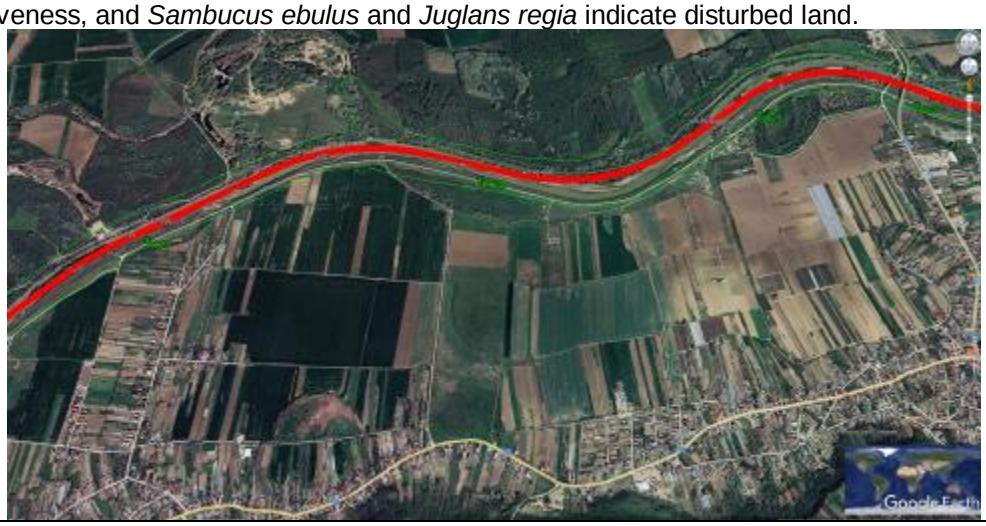
	
VP 6 – km 72+000	The vantage point 6 has a diverse vegetation, consisting of plant communities that do not fit into a clearly defined natural habitat according to the Romanian or NATURA 2000 classifications, but reflect a mix of aquatic, marsh, ruderal, grassland and invasive woody species. Aquatic vegetation includes species such as *Phragmites australis* (CA index: 1) and *Polygonum hydropiper* (CA index: 1), growing at the water's edge and in temporarily flooded microhabitats. Marsh plants, such as various species of Scirpus (+) and Epilobium (+), suggest transition zones to wetland habitats, but are present in low numbers, indicating rather intermittent wetlands. In contrast, ruderal vegetation is well represented by invasive species such as *Erigeron annuus* (CA index: 2), *Ambrosia artemisiifolia* (+) and *Chenopodium* album (+), which cover dry banks. At the same time, dry grassland species such as *Agrostis capillaris* (CA index: 1) and *Vulpia myuros* (CA index: 1), are present sporadically, suggesting ruderal grasslands. Woody and invasive species such as *Amorpha fruticosa* (CA index: 3), *Ailanthus altissima* (+) and *Prunus cerasifera* (+) are found at this point of observation.
VP 7 – km 70+000	The vantage point 7 shows some characteristic features of the habitat R4406 - Danubian-Pannonian forests of white poplar *(Populus alba*) with *Rubus caesius*. *Populus alba* (white poplar) is well represented at the analysed point (CA index: 3), and specific shrubs such as *Crataegus monogyna*, *Rosa canina* suggest a similarity with the shrub layer characteristic of this type of forest, but the invasive species *Amorpha fruticosa* (CA index: 3) intertwines with this habitat, causing a degraded structure. Thus, the area does not fully reflect the characteristic composition of this meadow habitat. There are also some ruderal and meadow plants, such as *Elymus repens* (couch grass, CA index: 1), *Hypericum perforatum* (St John's wort) and Centaurea sp. (CA index: 1), suggesting an anthropogenic influence on the area. Marsh and aquatic plants such as *Phragmites australis* (reed, CA index: 1) and *Scirpus* (CA index: 1), indicate the existence of wet or temporarily flooded microhabitats near the watercourse. In conclusion, the observed vegetation represents a diverse community with meadow influences, but without the complete structure of a well-defined R4406 habitat. 

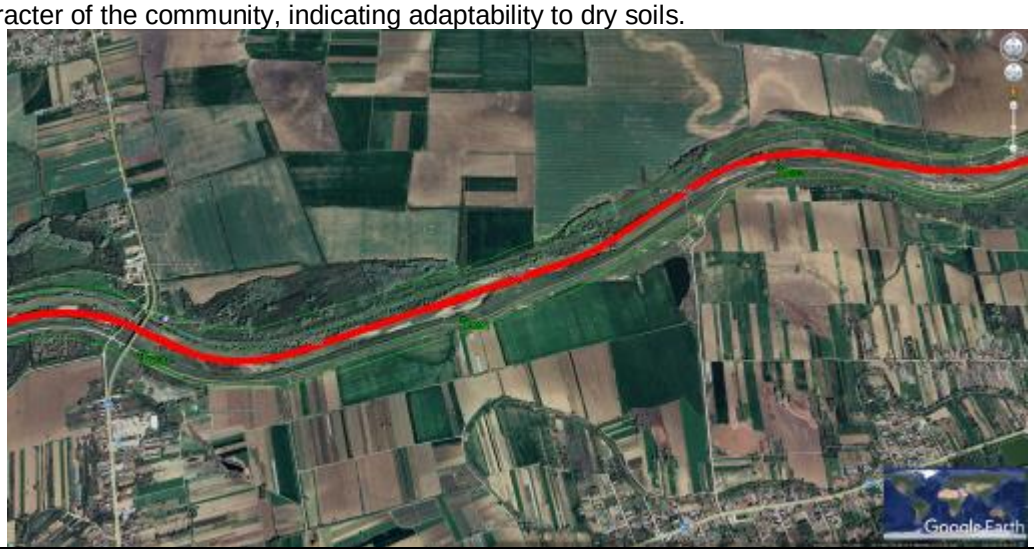
VP 8 – km 68+200	At the vantage point 8, an alluvial meadow-type vegetation is observed, characterised by the dominant presence of white poplar *(Populus alba*, CA index: 1) and black poplar *(Populus nigra*, CA index: 2), along with white willow *(Salix alba*, CA index: 1) and invasive species such as *Amorpha fruticosa* (CA index: 1). These species are characteristic of the meadow habitats described in R4406 - Danubian-Pannonian forests of white poplar with *Rubus caesius* and R4407 - Danubian forests of white willow with *Rubus caesius*. The grass layer includes ruderal and meadow species such as *Cynodon dactylon* (CA index: 2), *Trifolium repens* and *Hypericum perforatum*, indicating an anthropogenic influence and a mixture of invasive and disturbance-adapted flora. In addition to the typical alluvial meadow structure, ruderal communities can also occur in open areas, favoured by species such as *Erigeron annuus* and *Berteroa incana*, which complement the floristic diversity but do not contribute to a well-defined natural habitat. Thus, the **vegetation at the point of observation 8 reflects an alluvial community influenced by human activity, partly compatible with habitats R4406 and R4407, corresponding to European habitat *92A0 - Salix alba and Populus alba galleries***, but lacking a complete floristic structure and with numerous invasive ruderal species affecting its structure (Fig. 59).
VP 9 – km 67+600	The vantage point 9 shows a varied vegetation characteristic of an anthropogenically influenced meadow area with dominant elements of ruderalised and disturbance-adapted communities. Vegetation includes species such as *Salix alba* (CA index: +), *Amorpha fruticosa* (CA index: 2), and *Prunus cerasifera* (CA index: 1), suggesting a modified riparian meadow structure. The presence of ruderal species such as *Cynodon dactylon* (CA index: 2), *Ambrosia artemisiifolia* and *Ailanthus altissima* (CA index: 2) indicate an anthropogenic influence and a high level of invasiveness, characteristic of open and disturbed habitats. The plant community identified at point 9 may be partly compatible with habitat R4406 - Danubian-Pannonian forests of white poplar *(Populus alba*) with *Rubus caesius* and, to a lesser extent, with R4407 - Danubian forests of white willow with *Rubus caesius*, associated with **NATURA 2000** habitat **92A0 - *Salix alba* and *Populus alba* galleries**. However, the specific structure of these habitats is not fully represented, as the community is dominated by opportunistic and invasive species.
VP10 – km 66+100	At the vantage point 10, the situation is similar to point 9. The dominance of species such as *Populus alba* (CA index: 1) and *Morus alba* suggest a partial compatibility with the habitat R4406 - Danubian-Pannonian forests of white poplar with *Rubus caesius*, specific to the lowland meadows of southern Romania. In addition, the presence of *Salix alba* and shrubs such as *Cornus sanguinea* and *Rosa canina* suggest the influence of habitat R4407 - Danubian forests of white willow with *Rubus caesius*. **Both of these Romanian habitat types are associated with the NATURA 2000 habitat 92A0 - *Salix alba* and *Populus alba galleries*, found in the large riverbeds.** In addition to these meadow elements, the list includes ruderalised and open grassland species such as *Cynodon dactylon* (CA index: 1), *Agrostis stolonifera* and *Bromus sterilis*, typical of disturbed areas. Thus, although the area shows similarities with the meadow habitats R4406 and R4407, the floristic composition and the presence of ruderal elements suggest an anthropogenically influenced community with an incomplete structure to be fully included in these natural reference habitats.
VP 11 – km 64+700	The vantage point 11 presents a floristic structure similar to that observed in points 9 and 10, with riparian characteristics partially compatible with the **NATURA 2000** habitat **92A0 - *Salix alba* and *Populus alba* galleries**, corresponding to the Romanian habitats R4406 - Danubian-Pannonian forests of white poplar with *Rubus caesius* and R4407 - Danubian forests of white willow with *Rubus caesius*. Similarly to the previous points, the vegetation includes dominant meadow species such as *Populus alba* (CA index: 1), *Salix alba*, *Morus alba*, and shrubs such as *Cornus sanguinea* and *Amorpha fruticosa* (CA index: 2 and CA index: 3). The presence of ruderal and invasive species such as *Bromus sterilis* and *Robinia pseudoacacia* also suggests a significant anthropogenic influence, similar to that observed at the previous points. The absence of characteristic species and anthropogenic influences limit full compatibility, similarly to the observations in points 9 and 10.

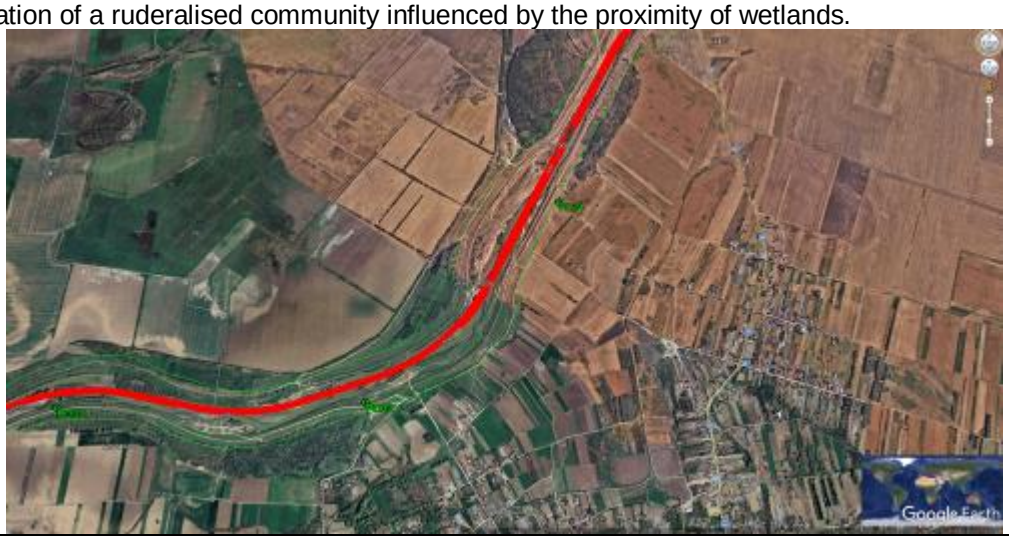
	
VP 12 – km 63+000	The vantage point 12 is similar to the previous points (9, 10, 11) in that it is an alluvial meadow influenced by anthropogenic processes, but with some specific elements that give it a unique structure. The vegetation is dominated by riparian species such as *Populus alba* (CA index: 3), *Salix alba* (CA index: +) and *Populus nigra* (CA index: 2), complemented by shrubs such as *Cornus sanguinea* and *Sambucus nigra* (CA index: 2). These species **suggest partial compatibility with NATURA 2000 habitat 92A0 - *Salix alba* and *Populus alba* galleries, equivalent to Romanian habitats R4406 and R4407.** A distinctive feature of point 12 is the presence of marsh grassland species such as *Scirpus sylvaticus* and *Equisetum hyemale*, which suggest the existence of temporary wet microhabitats. These species indicate a meadow with fluctuating humidity. Anthropogenic influence is suggested by the presence of ruderal species such as *Bromus sterilis* and *Cynodon dactylon*, reflecting disturbance similar to those at points 9, 10 and 11. In conclusion, point 12 combines meadow and wetland microhabitat elements, but, similarly to the previous points, human influences and the absence of key meadow species limit full compatibility with the natural reference habitats (Fig. 60).
VP 13 – km 61+500	The vantage point 13 has anthropogenically influenced vegetation, dominated by invasive and ruderal species, together with riparian species. The presence of *Populus alba* and *Populus nigra* (both with CA index: 1), together with *Salix purpurea* (CA index: 1), **suggests a partial compatibility with the riparian meadow habitats associated with the NATURA 2000 habitat 92A0 - *Salix alba* and *Populus alba* galleries.** Ruderal and invasive species such as *Erigeron annuus* (CA index: 1), *Bromus sterilis* and *Amorpha fruticosa* (CA index: 1 and 2), indicate a significant anthropogenic influence, as they are present throughout the observed area and dominate the grass and shrub layer. Also, the species *Vulpia myuros* (CA index: 2) and *Ailanthus altissima* (CA index: 1) reinforces the ruderalised appearance and signals an anthropogenic disturbance in the area. Thus, the vegetation at this point is partly aligned with the meadow habitat 92A0, but is also characterised by a strong component of ruderal vegetation, typical of areas influenced by human activities. 
VP 14 – km	At the vantage point 14, the presence of *Rubus caesius* (CA index: 1), along with species such

60+000	as *Populus alba* (CA index: 1), *Populus nigra*, *Salix* sp. (CA index: 1), *Cornus sanguinea* and *Rosa canina*, **suggest a higher compatibility with the NATURA 2000 habitat 92A0 - *Salix alba* and *Populus alba* galleries** and the Romanian habitats R4406 - Danubian-Pannonian forests of white poplar with *Rubus caesius* and R4407 - Danubian forests of white willow with *Rubus caesius*. However, anthropogenic influences are still significant, reflected by invasive and ruderal species such as *Amorpha fruticosa* (CA index: 2) and *Cynodon dactylon* (CA index: 1/2), which indicates a similar degree of perturbation to that observed at points 9, 10 and 11. Although the vegetation structure of point 14 suggests a more well-defined meadow community, these ruderal and invasive influences continue to limit the full integration of the area into habitat 92A0 and equivalent Romanian habitats.
VP 15 – km 58+000	The point of observation 15 is notable for the presence of species associated with different types of alluvial and wet meadow vegetation, but also invasive and ruderal species, suggesting a significant anthropogenic influence. Dominant plants include *Phragmites australis* (CA index 3) and *Cynodon dactylon* (CA index 3), both adapted to areas of variable humidity, together with marsh species such as *Bolboschoenus* and *Mentha aquatica*, characteristic of intermittent wet habitats. Ruderal and invasive species, such as *Erigeron annuus* and *Ambrosia artemisiifolia*, emphasise the community's adaptability to human disturbance, including waterfront interventions and altered grasslands. The presence of Salix and Populus species, although limited in number, suggests a potential for partial compatibility with NATURA 2000 alluvial forest habitats type 92A0 (*Salix alba* and *Populus alba* galleries). However, the absence of edifying and characteristic species specific to these habitats reduces the degree of ecological coherence of the area, especially in the context of the fragmentation of the meadow vegetation. 
VP 16 – km 56+500	At the vantage point 16, the dominant vegetation includes a mixture of woody and invasive species, typical of fragmented alluvial meadow areas. Species such as *Amorpha fruticosa* (CA index: 4), *Populus nigra (CA index:* 2), *Salix alba* (CA index: +), *Salix fragilis* (CA index: +) and *Salix purpurea* (CA index: +) show an area influenced by invasive scrub and typical riparian vegetation. This composition indicates partial compatibility with meadow habitats, but is affected by anthropogenic invasion and disturbance.
VP 17 – km 55+000	At the vantage point 17, the area **could be partly compatible with the alluvial forest habitats of type R4406 - Danubian-Pannonian forests of white poplar (*Populus alba*) with *Rubus caesius* and R4407 - Danubian forests of white willow (*Salix alba*) with *Rubus caesius*,** as there are dominant species such as *Populus alba*, *Populus nigra*, and *Salix alba*, which are characteristic for both habitats, but in the grass and shrub layer, species such as *Amorpha fruticosa* are present (in high proportion), suggesting anthropogenic and invasive influences.
VP 18 – km 53+200	At the vantage point 18, the vegetation is dominated by invasive and ruderal species, reflecting a significant anthropogenic influence. *Amorpha fruticosa*(CA index: 4) dominates the shrub structure. Other notable species include *Juglans regia* (CA index: 2), together with *Acer negundo* (CA index: 1), which reinforces the altered character of the vegetation. Typical lowland woody species, such as *Populus alba*, *Salix purpurea* and *Populus nigra*, are present, but in low abundance (CA index: 1 or +), suggesting that the area is not a well-defined habitat. Other ruderal and invasive species, such as *Bromus sterilis*, *Euphorbia cyparissias* and *Sorghum halepense*, emphasise the ruderalised character of the vegetation.

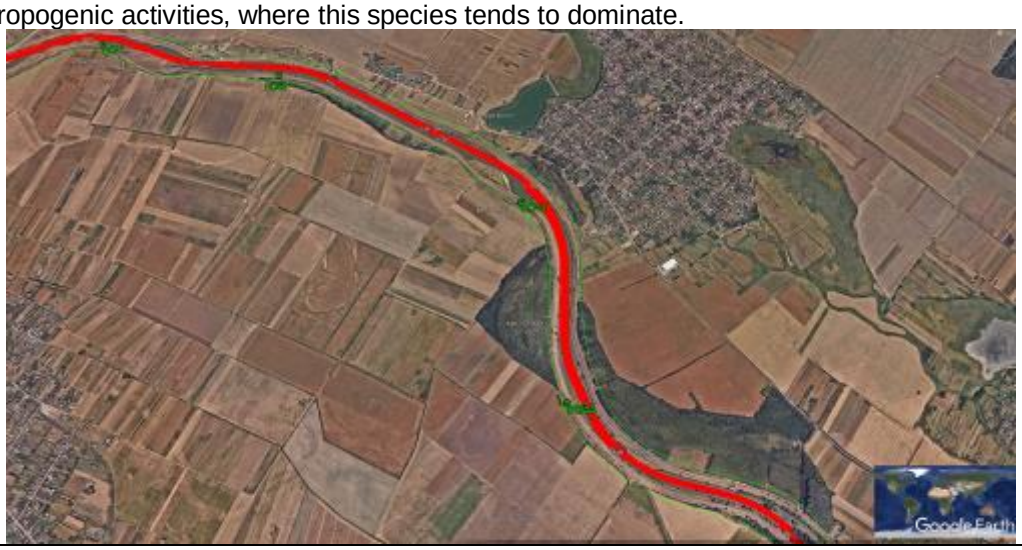
	
VP 19 – km 51+900	At the vantage point 19, the vegetation is a mosaic of alluvial meadow and marsh habitats with ruderal and invasive influences. The woody species *Populus alba*, *Populus nigra*, and *Salix purpurea*, present in low abundance, suggest a slight compatibility with R4406 or R4407 habitats, characteristic of large but poorly developed meadows. In wetter and temporarily flooded areas, the presence of species such as *Polygonum hydropiper*, *Scirpus sylvaticus*, and *Lemna* sp. indicates a temporary marsh community, typical of the meadows. The vegetation is also heavily affected by ruderal and invasive species such as *Amorpha fruticosa* (CA index: 2), *Cynodon dactylon, Xanthium strumarium*, and *Sorghum halepense*, which emphasise anthropogenic influences and the disturbed character of the area.
VP 20 – km 50+000	At the vantage point 20, the vegetation is a combination of ruderal communities and temporary wetlands. Species *Scirpus sylvaticus* (CA index: 1) indicates the presence of a wetland, temporarily floodable. At the same time, the presence of ruderal and invasive species such as *Cynodon dactylon* (CA index: 1), *Bromus sterilis* (CA index: 1), and *Filago germanica* (CA index: 3), emphasises a ruderal character, specific to land disturbed by anthropogenic activities. *Urtica dioica* and *Rumex patientia*, together with *Matricaria* sp. (all with CA index: +), suggest a nutrient-rich soil, common in ruderal communities. In conclusion, this vantage point could include both a ruderal habitat (R8703) associated with uncultivated and nitrophilic-rich soils and temporary marsh influences characteristic of floodplains. These plant community types have no conservation value. 
VP 21 – km 48+500	At the vantage point 21, the vegetation is characterised by both ruderal-anthropic and dry grassland communities. Species such as *Bromus sterilis* (CA index: 3) and *Vulpia myuros* (CA index: 2) suggest a ruderalised grassland structure on dry soils, common in disturbed areas. The presence of drought-adapted species such as *Descurainia sophia* and *Carthamus lanatus* (CA index: +) emphasises the ruderal character of the community. Also, *Onopordum acanthium* and *Carduus acanthoides* (both CA index: +) indicate a compatibility with ruderalised habitats (R8702) characteristic of unproductive land and roadsides. These plant community types have no conservation value
VP 22 and VP 23 - km 47+000	At the vantage points 22 and 23, the vegetation suggests a ruderalised xerophytic grassland community dominated by dry and invasive grassland species. Species *Calamagrostis epigejos* (CA index: 4) is dominant, typical of dry and disturbed grasslands, suggesting an open ruderal

	habitat. Other species present, such as *Bromus sterilis* (both with CA index: 2), together with *Achillea setacea* (CA index: 2), emphasise the xerophytic character of the vegetation, indicating adaptability to dry soils and drought conditions. *Hordeum murinum* (CA index: 2) and *Matricaria* sp. (CA index: 1) complete the picture, being ruderal species characteristic of anthropogenic areas and nutrient-rich soils. 
VP 24 – km 46+000	At the vantage point 24, the vegetation suggests a ruderal and xerophytic character, specific to disturbed and dry habitats. The presence of *Bromus sterilis* and *Achillea setacea* suggest a dry environment, typical of ruderalised xerophytic grasslands, and species such as *Matricaria* sp. and *Juglans regia* indicate an anthropogenic influence. This floral composition is characteristic of a ruderal habitat (R8702), commonly found on unproductive, disturbed or roadside land
VP 25 and VP 26 – km 44+600 – km 43+100	At points 25 and 26, the vegetation is composed of wetland species and ruderal influences. *Phragmites australis* (CA index: +) and *Typha angustifolia* (CA index: +) are species characteristic of marsh habitats, indicating a temporarily floodable wetland common in large floodplain, compatible with the R5309 Phragmites and Schoenoplectus type habitats. **The woody species *Salix alba*, *Salix fragilis*, and *Populus nigra* suggest a potential compatibility with alluvial forest habitats of type R4407 (white willow forests**). In the grass layer, ruderal species such as *Bromus sterilis* (CA index: 1), *Calamagrostis epigejos* (CA index: 1), and *Cynodon dactylon* (CA index: 1) suggest an anthropogenic influence, specific to areas disturbed by human activities.
VP 27 – km 42+000	At the vantage point 27, the vegetation is a mixed community of xerophytic grassland and meadow zones with anthropogenic-ruderal influences. The presence of *Salix alba* (CA index: 2) and *Populus nigra* (CA index: +) suggests a compatibility with alluvial meadow habitats specific to white willow and black poplar forests in the floodplain of large rivers, typical for habitat **R4407** (white willow forests), corresponding to: 92A0 *Salix alba* and *Populus alba,* but without a well-defined structure. The ruderal and xerophytic species *Cynodon dactylon* (CA index: 2), *Achillea setacea* (CA index: 1), and *Calamagrostis epigejos* indicate a ruderal influence on dry, drought-adapted soils. Also, the presence of *Amorpha fruticosa* suggests a degree of anthropogenic invasiveness, and *Sambucus ebulus* and *Juglans regia* indicate disturbed land. 
VP 28 – km 40+100	At the vantage point 28, the vegetation indicates an alluvial marsh and ruderal grassland community, influenced by variable moisture and anthropogenic activities. The species

	Phragmites australis (CA index: 2) and *Scirpus sylvaticus* suggest a typical alluvial wetland habitat, compatible with marsh habitats such as R5309 (Phragmites and Schoenoplectus communities), which however is not of high conservation value. The species *Lycopus europaeus* and *Butomus umbellatus* reinforce the wet character of the habitat, being common in marshes and floodplains along rivers. In the grassland continuing the bank, the species *Bromus sterilis* (CA index: 2) and *Cynodon dactylon* (CA index: 1) indicate a ruderal component, adapted to disturbed soils, specific to anthropized soils. The presence of *Amorpha fruticosa* (CA index: 2), an invasive species, emphasises the degree of disturbance.
VP 29 – km 38+600	At the vantage point 29, the vegetation suggests a ruderal dry grassland community with species adapted to disturbed and dry soils. *Cynodon dactylon* (CA index: 2) and *Bromus sterilis* (CA index: 1) are typical species of open ruderal habitats, indicated by their frequent occurrence on unproductive or marginal land, characteristic of ruderalised habitats (R8703). *Calamagrostis epigejos* (CA index: 1) reinforces the xeric character of the community, as it is common in dry and disturbed grasslands. Other notable species, such as *Verbascum phlomoides*, *Vulpia myuros*, and *Eryngium campestre*, emphasise adaptability to dry conditions and anthropogenic disturbance.
VP 30 – km 37+800	At the vantage point 30, the vegetation suggests a xerophytic grassland community and alluvial meadow areas with ruderal influences. The woody species *Salix alba* and *Populus nigra* (both with CA index: +) indicate a possible compatibility with alluvial meadow habitats, typical for R4407 meadow forests (white willow forests). The grass layer is dominated by xerophytic and ruderal species such as *Bromus sterilis* (CA index: 2) and *Achillea setacea* (CA index: 1), specific to dry and disturbed grasslands. Other notable species, such as *Securigera varia* and *Vulpia myuros*, emphasise the xerophytic character of the community, indicating adaptability to dry soils. 
VP 31 – km 36+000	At the vantage point 31, the vegetation indicates a mixed wetland and ruderal grassland community, influenced by anthropogenic activities and variable moisture conditions. The species *Scirpus sylvaticus* and *Typha angustifolia* (CA index: 1) suggests the presence of a temporary wetland, associated with marsh habitats and palustrine vegetation, commonly found in alluvial micro-depressions in riverbeds. *Amorpha fruticosa* (CA index: 2) is an invasive species emphasising the anthropogenic influence in this habitat, and *Sambucus ebulus* (CA index: 2) and *Cynodon dactylon* (CA index: 1) suggests a ruderal character of the vegetation. These species, along with *Bromus sterilis* (CA index: 1) and *Calamagrostis epigejos* (CA index: 2), characterise a disturbed grassland community, specific to dry and ruderalised soils. The floral composition reflects a mosaic of alluvial and ruderal vegetation, adapted to the variable moisture conditions and anthropogenic activities in the meadow area (Fig. 61).
VP 32 – km 34+500	At the vantage point 32, the vegetation reflects a mosaic of ruderal xerophytic grassland and alluvial habitat. The woody species *Salix alba* and *Populus alba* (CA index: +) suggest a compatibility with meadow woodland habitats such as R4406 (white poplar forests) or R4407 (white willow forests) in large river valleys, specific of floodplain areas, but their abundance is low at this point. In the grass layer, *Plantago arenaria* (CA index: 3), together with species such as *Achillea setacea* (CA index: 1) and *Cynodon dactylon* (CA index: 1), *Bormus tectorum* (+), emphasise a xerophytic influence, typical of dry and sandy grasslands (R6404), where *Plantago arenaria* is suggestive. The presence of the species *Amorpha fruticosa* (CA index: 2), an invasive species, and the presence of ruderal species such as *Hordeum murinum* (CA index: 2)

	reflect a degree of anthropogenic disturbance (Fig. 62).
VP 33 – km 33+000	At the vantage point P33, the vegetation shows a mosaic of ruderal grassland with alluvial influences, dominated by species adapted to dry and disturbed conditions, with little influence from meadow elements. *Amorpha fruticosa* (CA index: 2) and *Sambucus ebulus* (CA index: 1) are ruderal and invasive species reflecting the degree of disturbance, and *Cynodon dactylon* and *Achillea setacea*(both with CA index: 1) add a xerophytic character, typical of dry grasslands and marginal soils. The occasional presence of *Salix alba* (CA index: +) suggests an alluvial influence, but it is not sufficient to define a specific meadow habitat, being rather an indication of a ruderalised community influenced by the proximity of wetlands. 
VP 34 – km 31+300	At the vantage point 34, the vegetation suggests a mosaic of ruderal grassland with alluvial influences and xerophytic elements, without a clear compatibility with a well-defined Romanian natural habitat. *Amorpha fruticosa* (CA index: 3) dominates the vegetation structure, indicating strong anthropogenic disturbance and high invasiveness. The occasional presence of alluvial species such as *Salix alba* and *Populus nigra* (CA index: +) suggest insufficient alluvial influence to justify a meadow habitat (R4406 or R4407). In the grass layer, xerophytic species such as *Achillea setacea* and *Cynodon dactylon* (CA index: 1) indicate an adaptation to dry soils, completing the ruderal and diversified character of this point, without corresponding to a specific Romanian natural habitat.
VP 35 – km 29+500	At the vantage point 35, the vegetation suggests a mixed ruderal and alluvial community, without clearly falling under a well-defined Romanian habitat, but with meadow influences. The species *Salix alba* and *Populus nigra* (both with CA index: +) suggest an alluvial influence, but their low presence indicates that they do not constitute a defined meadow forest habitat (such as R4406 or R4407). Dominance of ruderal species such as *Bromus sterilis* (CA index: 2) and *Amorpha fruticosa* (CA index: 1) reflects anthropogenic disturbance and ruderalised influences on the area, typical of invaded or uncontrolled habitats. In the grass layer, species adapted to dryland and marginal soils, such as *Achillea setacea* and *Plantago lanceolata*, add a xerophytic character. 
VP 36 and VP 37 - km	At the vantage points 36 and 37, the vegetation suggests a ruderal and alluvial community with anthropogenic plantation influences, due to the dominant presence of *Robinia pseudoacacia*

28+000 - km 27+700	(CA index: 4), a species often cultivated and invasive in lowland areas. *Populus alba* (CA index: +) indicates alluvial influences, but its low abundance suggests that it does not form a well-structured meadow habitat such as R4406 (white poplar forests); moreover, at this point, there also are the alien species and *Salix babylonica* (cultivated). The grass layer includes ruderal and xerophytic species such as *Cynodon dactylon* (CA index: 2) and *Achillea setacea* (CA index: 1), reflecting dry grassland influences. In conclusion, this point represents a mosaic of ruderal habitat and alluvial influences, marked by the acacia plantation and xerophytic and ruderal species, without a clear compatibility with a well-defined Romanian natural habitat
VP 38 - km 26+000	At the vantage point 38, the vegetation suggests a mixed ruderal community with alluvial influences and wet meadow elements, without a clear compatibility with a well-defined Romanian natural habitat. Species such as *Salix alba* and *Salix fragilis* (both with CA index: +) suggest a slight alluvial influence, but the low abundance indicates that it does not form a typical meadow habitat, such as R4407 (Danubian forests of white willow) (Habitats of Romania). Dominance of ruderal species such as *Bromus sterilis* (CA index: 2) and *Amorpha fruticosa* (CA index: 2) reflects the anthropogenic disturbance and ruderal character of the area. In the grass layer, xerophytic and ruderal species such as *Cynodon dactylon* (CA index: 2) and *Achillea setacea* (CA index: 1) are present and reflect adaptations to dry and disturbed areas. 
VP 39 - km 25+000	At the vantage point 39, species such as *Phragmites australis* and *Typha angustifolia* (both with CA index: +) suggest a marsh habitat, common in the Danube meadows and inland riverbanks. The dominance of *Trifolium fragiferum* (CA index: 2), a species characteristic of wet grasslands and periodically flooded soils, reinforces this influence. In contrast, the presence of the invasive species *Amorpha fruticosa* (CA index: 2), along with ruderal species such as *Bromus sterilis* and *Ambrosia artemisiifolia* (both with CA index: 1), reflects a high degree of anthropogenic disturbance and a pronounced ruderal character. In the grass layer, xerophytic and ruderal species such as *Cynodon dactylon* and *Achillea setacea* (both with CA index: 1) indicate adaptation to dry and disturbed soils, completing the diversity of the community. Although elements such as *Salix fragilis* suggest an alluvial influence, they are not dominant in a typical meadow habitat.
VP 40 – km 23+400	At the vantage point 40, the vegetation suggests a ruderal community with xerophytic and wet grassland influences. Dominance of *Bromus inermis* and *Elymus repens* (both with CA index: 2) indicates a ruderal character, specific to disturbed areas, where these perennial grasses are common and adapted to dry conditions and disturbed soils. *Cynodon dactylon* (CA index: 1), a ruderal and xerophilous species, supports this character of the area, together with *Bothriochloa ischaemum* (CA index: 1), which is adapted to dry grasslands and may be an indicator of xerophytic vegetation, commonly found in the forest. The presence of *Trifolium fragiferum* (CA index: +), typical of wet grasslands, and *Butomus umbellatus* (CA index: +), a species characteristic of marshes and floodplains, suggests that there are areas of higher humidity. Thus, the area is a mosaic of ruderal, xerophytic and wet grassland communities **with no clear categorisation into a defined habitat.**
VP 41 – km 22+000	At the vantage point 41, the vegetation is diverse, including alluvial, ruderalised and swamp-influenced communities. Aquatic and marsh species such as *Lemna minuta* (CA index: 3), *Typha latifolia*, *Phragmites australis*, and *Butomus umbellatus* suggest the presence of high moisture zones, characteristic of marsh and wetland habitats common in the Danube meadow. On the other hand, species such as *Artemisia austriaca* (CA index: 2) and *Bothriochloa ischaemum* (CA index: 2) indicate a xerophytic and ruderal character, typical for dry areas and

	disturbed soils. Invasive species such as *Amorpha fruticosa*(CA index: 1) and the presence of ruderal species such as *Cynodon dactylon*, *Bromus sterilis* and *Xanthium spinosum* suggest anthropogenic-disturbed influences in this area.
VP 42 – km 20+400	At point 42, the vegetation observed combines ruderal and swamp elements. The presence of the species *Typha latifolia*, together with *Phragmites australis*, indicates the existence of wetlands typical for marsh habitats, where these species form dense communities in alluvial soils, characteristic of river banks or floodplains. Also, *Bothriochloa ischaemum* (CA index: 2) and *Cynodon dactylon* (CA index: 3) suggest dry, potentially xerophytic portions, typical of ruderalised habitats common in disturbed areas. The ruderal component is emphasised by the presence of *Bromus sterilis*, *Lolium perenne*, and *Bromus inermis*, all of which have a CA index: 1. Species such as *Amorpha fruticosa* (CA index: 2) add an invasive and disturbed character, specific to meadow habitats altered by anthropogenic activities, where this species tends to dominate. 
VP 43 – km 18+000	At the vantage point 43, the vegetation predominantly consists of ruderal and riparian species, with the presence of meadow species such as *Populus alba* and *Salix alba*, both with a CA index 1, indicating a potential meadow habitat. However, their presence in limited numbers and low abundance suggests that a fully developed forest habitat type R4406 - Danubian white poplar forests or R4407 - White willow forests may not form. On the other hand, ruderal components such as *Ambrosia artemisiifolia* (CA index: 1) and *Lolium perenne* (CA index: 1), together with herbaceous species typical of dry soils, support a community influenced by anthropogenic disturbance and vegetation ruderalisation.
VP 44 – km 16+500	At the vantage point 44, the plant community is dominated by ruderal and invasive species, with a significant presence of *Amorpha fruticosa* (CA index: 2) and *Prunus cerasifera* (CA index: 2), *Gleditsa triachantos* (CA index:+), indicating an invasive character specific to anthropized meadow areas. Also present are *Populus alba* (CA index: 1) and *Salix alba* (CA index: 1), in a herbaceous layer with *Rubus caesius* (CA index:2) suggesting association with meadow habitats typical of Danubian white willow and white poplar forests (R4407 and R4406), which have a corresponding habitat in: NATURA 2000: 92A0 *Salix alba* and *Populus alba* galleries. Wetland species such as *Lemna trisulca* (CA index: 1) and *Iris pseudacorus* are characteristic of stagnant water areas, suggesting the presence of aquatic microhabitats in the vicinity. The structure is complemented by species such as *Trifolium campestre* and *Plantago arenaria* (CA index: 1), adapted to alluvial and disturbed soil conditions, supporting the mixed character of the community between wet meadow habitats and invaded areas.
VP 45 – km 14+000	At the vantage point 45, the vegetation includes species such as *Humulus lupulus* (CA index: 1), *Vicia cracca* (CA index: 1), and *Amorpha fruticosa* (CA index: 3), suggesting the presence of anthropogenic influences, mainly due to invasive species. Also *Salix alba* (CA index: 1) and *Populus alba* (CA index: +) suggest a potential association with habitat R4407 - Danubian forests of white willow with *Rubus caesius* (NATURA 2000: 92A0), common in the large valleys and rivers of southern Romania. However, the sparse cover of willow and poplar makes it difficult to clearly assign this habitat, and a transition zone with significant anthropogenic influence is more likely.

	
VP 46 – km 12+000	At the vantage point 46, the vegetation is diverse, including species associated with alluvial and riparian habitats, but shows anthropogenic and invasive influences. Woody species such as *Salix alba* (CA index: 1) and *Populus alba* (CA index: 1) alongside the herbaceous layer with *Rubus caesius* (CA index: 2) indicate compatibility with habitat 92A0 - *Salix alba* and *Populus alba* gallery forests, but *Amorpha fruticosa* (CA index: 2), an invasive species, is prevalent and affects the integrity of the natural habitat. The grass layer is dominated by species such as *Brachypodium sylvaticum*, *Lolium perenne* (CA index: 1) and *Agrostis stolonifera* (CA index: 1), which emphasises a mixed vegetation of ruderal grasslands and riparian zones, adapted to wet or alluvial conditions. *Trifolium campestre* also suggests an association with ruderal habitats in the lower riverbeds.
VP 47 – km 9+000	For the vantage point 47, the vegetation composition includes characteristic ruderal grassland species *Plantago lanceolata*, *Cardaria draba*, and *Galium mollugo*, mixed with invasive species such as *Erigeron annuus*, *Ambrosia artemisiifolia*. *Amorpha fruticosa* is present (invasively present). *Salix alba* and *Ulmus minor, Juglans regia*, *Rosa canina* and *Crataegus monogyna* suggest a riparian zone influence, but without the density of alluvial forests.
VP 48 – km 6+800	At the vantage point 48, the vegetation shows a mixed community of ruderalised shrublands with alluvial meadow influences, characterised by the presence of the woody species *Ulmus minor*, *Populus alba*, *Salix alba*, and *Fraxinus pennsylvanica* (all with CA index: +). The grass and shrub layer is dominated by ruderal and invasive species such as *Amorpha fruticosa* (CA index: +), an invasive species that contributes to the disturbance of the natural habitat balance and reflects anthropogenic influences in the area. Other common species include *Galium mollugo* (CA index: 2), *Bromus sterilis*, *Plantago lanceolata*, and *Lolium perenne* (all with CA index: 1), which are characteristic of ruderal grasslands adapted to disturbed soils. Thus, this point can be described as a mosaic of ruderal vegetation and meadow elements, with the presence of characteristic wetland species, but insufficiently developed to be considered a well-defined alluvial habitat, due to the low abundance of riparian species and strong influences from invasive and ruderal species. 
VP 49 and	Here, the vegetation is dominated by *Amorpha fruticosa* (abundance 3), *Bromus sterilis*

VP 50 – km 5+100 – km 3+600	(abundance index 2), *Lolium perenne* (abundance index 2), *Galium mollugo* (abundance index 2), *Trifolium fragiferum* (abundance index 2), and *Morus alba* (abundance index 2). **A population of *Marsilea quadrifolia*** (Fig. 63), **a species of European interest, protected under the Natura 2000 network and listed in Annex II of the Habitats Directive, was observed at the vantage point 50, located at lock of the hydrotechnical node HN1 on the Argeș River.** 
VP 51-VP 53 – km 2+500 – km 0 +100	At the vantage points 51-53, the vegetation reflects a community dominated by invasive and ruderal species, mainly with the significant presence of the invasive *Amorpha fruticosa* (CA index: 3) and *Humulus scandens*, a European invasive species that dominates this habitat. The presence of these species indicates a high degree of anthropogenic disturbance (Fig. 64). The grass layer is complemented by ruderal species adapted to dry and disturbed soils, such as *Cynodon dactylon* (CA index: 1), *Aristolochia clematitis* (CA index: 1), and *Galium mollugo* (CA index: +), which emphasise the ruderal character of the community. In the area there is also *Ulmus minor* (CA index: +).



Figure no. 57 - Plant communities partially compatible with habitat 92A0 at the point of observation P03



Figure no. 58 - Plant communities partially compatible with habitat 92A0 at the point of observation P04 (invasive shrublands of *Amorpha fruticosa* are visible)



Figure no. 59 - Plant communities partially compatible with habitat 92A0 at the point of observation P08



Figure no. 60 - VP12: Riparian vegetation partial compatibility with habitat 92A0 and wet meadow with wet microhabitats, influenced by anthropisation



Figure no. 61 - Temporary wetland and ruderal grassland mosaic with partial compatibility for habitat 92A0 at the points observation 30 and 31



Figure no. 62 - Mixed plant community between wet meadow habitats and invaded areas, with partial compatibility for habitat 92A0 - *Salix alba* and *Populus alba* gallery, affected by ruderal and invasive species









Figure no. 63 - A detailed image of *Marsilea quadrifolia*, with the reflection of the surrounding vegetation at the point of observation 50.



Figure no. 64 - *Humulus scandens* communities dominating the banks of the Argeș river at the vantage points 50-53

5.4.2.2 Dâmbovița River

On the project route along the Dâmbovița River VP54-VP70), 123 plant taxa were inventoried (tab. 28). None of these taxa are of conservation interest in Romania, according to the national Red Lists (Boșcaiu et al. 1994, Dihoru & Dihoru 1994, Oltean et al. 1994) or the National Red Card (Dihoru & Negrean 2009). Also, none of the plant species identified along the Dâmbovița river is listed in the annexes of the Habitats Directive (Law 49/ 2011 on the protected areas regime in Romania).

97 of the inventoried taxa are native species, and 26 are alien species, with varying degrees of invasiveness, according to the literature (Project reports Management of invasive species in Romania: https://invazive.ccmesi.ro/publicatii/, Anastasiu & Negrean, 2009, Sîrbu & Oprea, 2011, etc.). Among alien species, 19 taxa are considered invasive or potentially invasive in Romania: *Acer negundo*, *Ailanthus altissima*, *Amaranthus powellii*, *Amaranthus retroflexus*, *Ambrosia artemisiifolia*, *Amorpha fruticosa*, *Bidens frondosa*, *Cuscuta campestris* subsp. *campestris*, *Datura stramonium*, *Erigeron annuus* subsp. *annuus*, *Erigeron canadensis*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Humulus scandens*, *Lemna minuta*, *Morus alba*, *Prunus cerasifera*, *Sorghum halepense* și *Xanthium spinosum*. The full list of species inventoried, including the status of alien species, is detailed in Table 28.

Table no. 28 - Taxa inventoried on the Dâmbovița river project route

No.	Scientific name	Common name	Status in Romania
1.	*Acer campestre*	Field maple	native
2.	*Acer negundo*	Box elder	invasive
3.	*Achillea setacea*	Bristly yarrow	native
4.	*Ailanthus altissima*	Tree of Heaven	invasive
5.	*Alcea rosea*		alien
6.	*Alisma plantago-aquatica*	Common water-plantain	native

7.	*Althaea officinalis*	Marsh mallow	native
8.	*Amaranthus powelii*		invasive
9.	*Amaranthus retroflexus*	Powell's amaranth	invasive
10.	*Ambrosia artemisiifolia*	Common ragweed	invasive
11.	*Amorpha fruticosa*	False indigo bush	invasive
12.	*Arctium lappa*	Greater burdock	native
13.	*Arctium tomentosum*	Woolly burdock	native
14.	*Aristolochia clematitis*	Birthwort	native
15.	*Arrhenatherum elatius*	False oat-grass	native
16.	*Artemisia absinthium*	Common wormwood	native
17.	*Artemisia austriaca*	Austrian mugwort	native
18.	*Artemisia vulgaris*	Common mugwort	native
19.	*Astragalus cicer*	Cicer milkvetch	native
20.	*Ballota nigra* subsp. *nigra*	Black-horehound	native
21.	*Berteroa incana*	Hoary alyssum	native
22.	*Berula erecta*	Lesser Water-parsnip	native
23.	*Bidens frondosa*		invasive
24.	*Brachypodium sylvaticum*		native
25.	*Bromus hordeaceus*		native
26.	*Bromus inermis*	Smooth brome	native
27.	*Bromus sterilis* subsp. *inermis*	-	native
28.	*Calamagrostis epigejos*	Wood small reed	native
29.	*Calystegia sepium*	Hedge bindweed	native
30.	*Cardaria draba*	Hoary cress	native
31.	*Carduus acanthoides*		native
32.	*Carduus nutans* subsp. *nutans*		native
33.	*Carthamus lanatus*	Saffron thistle	native
34.	*Centaurea nigrescens*	-	native
35.	*Ceratophyllum demersum*		native
36.	*Cephalaria transsylvanica*	Field scabious	native
37.	*Chenopodium album*	Lamb's quarters	native
38.	*Chondrilla juncea*	Rush skeletonweed	native
39.	*Cichorium intybus*	Chicory	native
40.	*Cirsium arvense*	Canada thistle	native
41.	*Cirsium vulgare*	Spear thistle	native
42.	*Conium maculatum*	Poison hemlock	native
43.	*Convolvulus arvensis*	Field bindweed	native
44.	*Crataegus monogyna*		native
45.	*Cuscuta campestris* subsp. *campestris*	Field dodder	invasive
46.	*Cynodon dactylon*	Bermudagrass	native
47.	*Dactylis glomerata*	CocksfootT)	native
48.	*Datura stramonium*	Jimson weed	invasive
49.	*Daucus carota* subsp. *carota*	Wild carrot	native
50.	*Digitaria sanguinalis*		native
51.	*Echium vulgare*	Viper's bugloss	native
52.	*Elymus repens* subsp. *repens*	Couch grass	native
53.	*Equisetum arvense*	Field horsetail	native

54.	*Equisetum hyemale*	Rough horsetail	native
55.	*Erigeron annuus* subsp. *annuus*	Annual fleabane	invasive
56.	*Erigeron canadensis*	Horseweed	invasive
57.	*Euphorbia esula*		native
58.	*Fraxinus pennsylvanica*	Green ash	invasive
59.	*Galium mollugo*	Hedge bedstraw	native
60.	*Gleditsia triacanthos*	v	pi
61.	*Heracleum sphondylium subsp. sphondylium*	Sosnowsky's hogweed	native
62.	*Hordeum murinum* subsp. *murinum*	Hogweed	native
63.	*Humulus scandens*	Japanese hop	invasive
64.	*Hypericum perforatum*	St. John's wort	native
65.	*Juglans regia*	English walnut	alien
66.	*Lactuca saligna*	-	native
67.	*Lactuca serriola*	Wild lettuce	native
68.	*Lathyrus tuberosus*	Earth pea	native
69.	*Lemna minuta*		potentially invasive
70.	*Linaria vulgaris*	Common toadflax	native
71.	*Lolium perenne*	Perennial ryegrass	native
72.	*Lotus tenuis*	Narrowleaf trefoil	native
73.	*Malva sylvestris*	Common mallow	native
74.	*Matricaria chamomilla*	Chamomile	native
75.	*Melilotus albus*	White sweet clover	native
76.	*Melilotus officinalis*	Yellow sweet clover	native
77.	*Mentha longifolia*	Horsemint	native
78.	*Morus alba*		invasive
79.	*Morus nigra*	Black mulberry	alien
80.	*Nymphoides peltata*		native
81.	*Odontites vernus*	Red bartsia	native
82.	*Onopordum achanthium*	Scotch thistle	native
83.	*Papaver rhoeas*	Common poppy	native
84.	*Pastinaca sativa*		native
85.	*Petrorhagia prolifera*		native
86.	*Phragmites australis*	Common reed	native
87.	*Plantago lanceolata* subsp. *lanceolata*	Ribwort plantain	native
88.	*Polygonum aviculare*	Common knotgrass	native
89.	*Polygonum hydropiper*	Water pepper	native
90.	*Polygonum lapathifolium subsp. lapathifolium*	Pale knotweed	native
91.	*Populus alba*	White poplar	native
92.	*Populus nigra*	Black poplar	native
93.	*Portulaca oleracea*	Purslane	alien
94.	*Potentilla reptans*	Creeping cinquefoil	native
95.	*Prunus cerasifera*	Cherry plum	Potentially invasive
96.	*Pyrus pyraster*	Wild pear	native
97.	*Reseda lutea*	Wild mignonette	native
98.	*Rosa canina*	Dog rose	native

99.	*Rubus caesius*		native
100.	*Rumex patientia subsp. patientia*	Patience dock	native
101.	*Salix alba*	White willow	native
102.	*Salix babylonica*	Weeping willow	alien
103.	*Salix fragilis*	Crack willow	native
104.	*Sambucus ebulus*	Dwarf elder	native
105.	*Scirpus sylvaticus*	Rough horsetail	native
106.	*Sclerochloa dura*		native
107.	*Securigera varia*	Crown vetch	native
108.	*Setaria pumila*	-	native
109.	*Silene latifolia* subsp. *alba*	White campion	native
110.	*Sonchus arvensis* subsp. *arvensis*		native
111.	*Sorghum halepense*	Johnsongrass	invasive
112.	*Tanacetum vulgare*	Common tansy	native
113.	*Torilis arvensis* subsp. *arvensis*		native
114.	*Tribulus terrestris*	Hedge parsley	native
115.	*Tripleurospermum inodorum*	Scentless mayweed	native
116.	*Typha latifolia*	Common cattail	native
117.	*Ulmus minor*	Field elm	native
118.	*Urtica dioica* subsp. *dioica*	Stinging nettle	native
119.	*Verbascum phlomoides*	Orange mullein	native
120.	*Verbascum speciosum*		native
121.	*Vicia cracca*	Tufted vetch	native
122.	*Xanthium orientale* subsp. *italicum*	Italian cocklebur	alien
123.	*Xanthium spinosum*	Spiny cocklebur	invasive

Based on the analysis conducted, the following species with a frequency of occurrence of more than 50% at the surveyed points were identified:

- *Humulus scandens* - present in 94% of the analysed plots.
- *Phragmites australis*, *Sambucus ebulus* - each present in 82% of the analysed plots.
- *Conium maculatum*, *Cynodon dactylon*, *Elymus repens* subsp. *repens* - each with a frequency of 70%.
- *Ballota nigra* subsp. *nigra*, *Carduus acanthoides*, *Polygonum hydropiper* - each present in 64% of the inventoried plots.
- *Onopordum acanthium*, *Prunus cerasifera* - with a frequency of 58%.
- *Bromus sterilis* subsp. *inermis* - present in 52% of the analysed plots.

Depending on soil moisture, which varies in relation to proximity to the watercourse and soil characteristics, the areas analysed along the Dâmbovița river can be classified as follows:

• **Floodplains**: characterised by permanently wet soils, ideal for hydrophytic and helophytic species. Species found include *Potentilla reptans*, *Typha latifolia*, *Salix alba*, *Salix fragilis*, *Bidens frondosa*, *Calystegia sepium*, *Polygonum hydropiper*, etc.

• **Temporarily flooded areas**: soils with variable moisture content, influenced by water level and rainfall, favourable to mesophytic plants that tolerate intermittent periods of high humidity. Examples of species identified include: *Ranunculus sceleratus*, *Humulus scandens*, *Polygonum lapathifolium* subsp. *lapathifolium*, *Conium maculatum*, *Mentha longifolia*.

• **Dry areas**: with low-moisture soils, located on higher banks or at a distance from the waterline, dominated by xerophytic vegetation. Species specific to this habitat type include *Cephalaria transsylvanica*, *Elymus repens* subsp. *repens*, *Hordeum murinum* subsp. *murinum*, *Achillea setacea*,

Daucus carota subsp. *carota*, *Sorghum halepense* etc.

- **Plant communities**

From the perspective of plant communities, the following observations can be made: the communities dominated by *Humulus scandens* are predominant along the Dâmbovița river. There are also other specific plant associations where *Humulus scandens* is present. The identified plant communities do not represent habitat types of Romanian, community or priority conservation interest. Table 29 shows the dominant plant communities in the analysed vantage points.

Table no. 29 - Plant communities in the analysed vantage points on the Dâmbovița river project route

VP54 - km 30+300	Communities with *Humulus scandens*, As. Scirpo-Phragmitetum W. Koch 1926 
VP55 - km 29+000	Communities with *Humulus scandens*
VP56 – km 27+700	Communities with *Humulus scandens*, *Coniuetum maculatum* I. Pop 1968,
VP57 – km 25+400	Communities with *Humulus scandens*, As. Scirpo-Phragmitetum W. Koch 1926,
VP58 – km 23+500	Communities with *Humulus scandens*, As. Scirpo-Phragmitetum W. Koch 1926, As. Sambucetum ebuli Felföldy 1942,Communities with Amorpha
VP59 – km 22+200	Communities with *Humulus scandens*, As. Scirpo-Phragmitetum W. Koch 1926.

	
VP60 – km 20+200	Communities with *Humulus scandens*
VP61 – km 19+000	Communities with *Humulus scandens*, As. Sambucetum ebuli Felföldy 1942
VP62 – km 16+300	Communities with *Humulus scandens*, As. Scirpo-Phragmitetum W. Koch 1926, As. Sambucetum ebuli Felföldy 1942 
VP63 – km 15+800	*Nympoidem peltate* (Allorge 1992) Bellot 1951
VP64 – km 15+100	Communities with *Humulus scandens*, As. Sambucetum ebuli Felföldy 1942
VP65 - km 12+000	Communities with *Humulus scandens*, As. Sambucetum ebuli Felföldy 1942
VP66 – km	Communities with *Humulus scandens*

10+300	
VP67 – km 8+000	Communities with *Humulus scandens*
VP68 – km 6+800	Communities with *Humulus scandens*
VP69 – km 4+600	As. Scirpo-Phragmitetum W. Koch 1926, with *Humulus scandens* 
VP70 – km 1+000	As. Scirpo-Phragmitetum W. Koch 1926, with *Humulus scandens*

On dry land, phytocenoses of Dauco-Cephalarietum transssylvanicae form, M. Coroi and A.M. Coroi 1998 (VP 54, 55).

The photographs below (Fig. 65-71) show the state of the plant communities identified along the Dâmbovița river, at the inventory points.



Figure no. 65 - Communities with *Humulus scandens*, As. *Scirpo-Phragmitetum* W. Koch 1926 - in the picture, VP54 Dâmbovița



Figure no. 66 - Vegetation on Dry areas: with poorly moist soils, located on higher banks or at a distance from the water line, where xerophytic vegetation predominates - in the picture, VP55 Dâmbovița



Figure no. 67 - Vegetation on Dry areas: with poorly moist soils, located on higher banks or away from the water line, with invasive species such as *Ambrosia artemisiifolia*. - in the picture, VP56 Dâmbovița



Figure no. 68 - Communities with *Humulus scandens*, As. Scirpo-Phragmitetum W. Koch 1926, As. *Sambucetum ebuli* Felföldy 1942, Communities with *Amorpha fruticosa* - in the picture, VP58 Dâmbovița



Figure no. 69 - *Nympoidem peltate* (Allorge 1992) Bellot 1951 at point 63 - Balta Tătaru - VP63 Dâmbovița



Figure no. 70 - Communities with *Humulus scandens* As. *Sambucetum ebuli* Felföldy 1942- in the picture, VP64 Dâmbovița



Figure no. 71 - As. Scirpo-Phragmitetum W. Koch 1926, with *Humulus scandens* - in the picture, VP70 Dâmbovița - at the confluence with the Argeș river

The surveys at each monitoring point, in tabular form, showing the Abundance-Coverage of the species observed, are included in Table 30.

Table no. 30 - Surveys carried out at vantage points along the Dâmbovița river

Taxon	54	55	56	57	58	59	60	61	62	63 - lake	64	65	66	67	68	69	70
1. *Acer campestre*											+						
2. *Acer negundo*	+																
3. *Achillea setacea*						+					+		+	2			
4. *Ailanthus altissima*																	
5. *Alcea rosea*				+					+								
6. *Alisma plantago-aquatica*																	+
7. *Althaea officinalis*												+					
8. *Amaranthus powelii*																	
9. *Amaranthus retroflexus*																	+
10. *Ambrosia artemisiifolia*	+	+	2	1													
11. *Amorpha fruticosa*					3												1
12. *Arctium lappa*				+													
13. *Arctium tomentosum*							+										
14. *Aristolochia clematitis*					1		+										
15. *Arrhenatherum elatius*								1									
16. *Artemisia absinthium*	+				+	2	+	+	+				+				
17. *Artemisia austriaca*					+												
18. *Artemisia vulgaris*	+	+	+										+				
19. *Astragalus cicer*						+											
20. *Ballota nigra* subsp. *nigra*			+	0			+		+				+	1		+	
21. *Berteroa incana*				1													
22. *Berula erecta*																	
23. *Bidens frondosa*							1										
24. Brachypodium sylvaticum													+		+		
25. *Bromus hordeaceus*																	2
26. *Bromus inermis*	1						1	2									
27. *Bromus sterilis* subsp. *inermis*		2		1	+	1	1	+				1		1			
28. *Calamagrostis epigejos*							1										

Taxon	54	55	56	57	58	59	60	61	62	63 - lake	64	65	66	67	68	69	70
29. Calystegia sepium																	
30. Cardaria draba	**+**	+					+	+									
31. Carduus acanthoides							+		+		+	+	+	+	+	0	
32. Carduus nutans subsp. *nutans*																1	
33. Carthamus lanatus														1	+		1
34. Centaurea nigrescens																	
35. Cephalaria transsylvanica	+				+												
36. Ceratophyllum demersum										+							
37. Chenopodium album			+				1						+				
38. Chondrilla juncea																	
39. Cichorium intybus	**+**	+															
40. Cirsium arvense	+	+	+								+						
41. Cirsium vulgare		+															
42. Conium maculatum	**+**	+	2	+		1	1	1	1		2			1		0	1
43. Convolvulus arvensis	+	+	2	+				+			+						
44. Crataegus monogyna									+		+						+
45. Cuscuta campestris subsp. *campestris*																	
46. Cynodon dactylon		+					1		1				1	2	3	2	1
47. Dactylis glomerata	+																
48. Datura stramonium																	
49. Daucus carota		+															
50. Digitaria sanguinalis																	
51. Echium vulgare		+	1	+													
52. Elymus repens subsp. *repens*	**1**	1			1	1	+	1					+	1	2		1
53. Equisetum arvense						1											
54. Equisetum hyemale					+						1						
*55. Erigeron annuus*subsp. *annuus*			+														
56. Erigeron canadensis				+													+
57. Euphorbia esula			1														
58. Fraxinus pennsylvanica	**+**		+														+
59. Galium mollugo				1		+							+				
60. Gleditsia triacanthos				+													
61. Heracleum sphondylium subsp. sphondylium							+		+								
62. Hordeum marinum															3	1	
63. Hordeum murinum subsp. *murinum*									2			1	+	2	1	2	
64. Humulus scandens	4	3	3	1	1	3	1	3	1		1	2	2	3		3	2
65. Hypericum perforatum	**+**																
66. Juglans regia	+	+					+						+				+
67. Lactuca saligna																	
68. Lactuca serriola		+											+				
69. Lathyrus tuberosus	**+**				+												
70. Lemna minuta									4	1							
71. Linaria vulgaris					+							+					
72. Lolium perenne														1			
73. Lotus tenuis			1														
74. Malva sylvestris									+								
75. Matricaria chamomilla		1		+					+								+

Taxon	54	55	56	57	58	59	60	61	62	63 - lake	64	65	66	67	68	69	70
76. Melilotus albus		+															
77. Melilotus officinalis																	
78. Mentha longifolia		+	+											+			
79. Morus alba		+			+		+		+								
80. Morus nigra																	+
81. Nymphoides peltata										**3**							
82. Odontites vernus																	
83. Onopordum achanthium		1				2	+	2	2			+	+	1	1		+
84. Papaver rhoeas					+	+					+						
85. Pastinaca sativa												+					
86. Petrorhagia prolifera				+													
87. Phragmites australis	**+**	+	1	3	+	2		1	1	3	2	2	1			2	1
88. Plantago lanceolata subsp. *lanceolata*	+	+															
89. Polygonum aviculare		+											1				
90. Polygonum hydropiper	1										1						
91. Polygonum lapathifolium sbsp. Lapathifolium							+				1	+		+		+	
92. Populus alba											4						
93. Populus nigra											4						
94. Portulaca oleracea				+													
95. Potentilla reptans																1	
96. Prunus cerasifera	+		+	+	1	+	+	+			+						1
97. Pyrus pyraster											+						
98. Reseda lutea														+			
99. Rosa canina	+						+	+									+
100. Rubus caesius	+				+												
101. Rumex patientia subsp. patientia	+	+					+						+				
102. Salix alba																	+
103. Salix babylonica																	
104. Salix fragilis													+				
105. Sambucus ebulus	+		1		1	3	+	2	2		2	2	1	1	1	2	1
106. Scirpus sylvaticus																+	
107. Sclerochloa dura													+		+		
108. Securigera varia	**+**		1						+								
109. Sedum rupestre				1													
110. Setaria pumila			+														
111. Silene latifolia subsp. *alba*	+						+										
112. Sonchus arvensis subsp. *arvensis*																	
113. Sorghum halepense	+	2	+		2			1									
114. Tanacetum vulgare	+																
115. Torilis arvensis subsp. *arv ensis*	+			+	+								+				
116. Tribulus terrestris													+				
117. Tripleurospermum inodorum		1							+								
118. Typha latifolia	+					1											
119. Ulmus minor	+											+					+
*120. Urtica dioica*subsp. *dioica*						1	+	+	1				1		1	+	
121. Verbascum phlomoides												+					
122. Verbascum speciosum	**+**																
123. Vicia cracca									+								
124. Xanthium orientale subsp. *italicum*		+	+	+		1		1									
125. Xanthium																	

Taxon	54	55	56	57	58	59	60	61	62	63 - lake	64	65	66	67	68	69	70
spinosum																	

5.4.3. Bird population

In order to identify the bird population in the project area of interest, two standard methodologies were applied, adapted to the field conditions and the period in which the assessment was carried out. Thus, 3 trips were made, two of them focused on a standard methodology, and one trip focused on the second standard methodology, but adapted to the needs and coverage area of the project, both described in the *Ministerial Order No. 1.358 of 6 August 2021 on the approval of the Standard Guidelines for the monitoring of bird species of Community interest in Romania, within the project "Supplementing the level of biodiversity knowledge through the implementation of the system for monitoring the conservation status of bird species of Community interest in Romania and reporting under Article 12 of the Birds Directive 2009/147/EC", funded under the Large Infrastructure Operational Programme 2014-2020",*as follows:

- Monitoring methodology for bird species characteristic of aquatic environments (Methodology 4. Monitoring protocol for nesting bird species characteristic of rivers), which consisted of a transect along the banks of the Argeș river, starting from the Mihăilești dam to the river's drain into the Danube, and Dâmbovița river, from the Bucharest ring road (Glina) to the river's drain into the Argeș. The survey was carried out over 4 concurrent days, i.e. 21-24 June 2023, during which time all bird species identified along the transect were recorded (Fig. 72);
- Methodology for monitoring bird species during the migratory season (by combining Methodologies 3, 5 and 10 of establishing fixed points - Vantage Points - along the perimeter of the PP and covering all critical areas of presence of bird species), which consisted in establishing a total of 70 vantage points, from VP01 to VP53, covering the Argeș River and VP54-VP70 covering the Dâmbovița River, with the points being covered during the prevernal migration period, i.e. 06-09 April 2023, and the autumn migration period, i.e. 20-23 September 2023, during which all the bird species identified in each vantage point were recorded. The approximate stopping time at a point was 15-30 minutes, with monitoring taking place over a full light-day (Figs 73-75).



Figure no. 72 - Sampling for the assessment of bird species characteristic for rivers (Mihăilești dam sector- Mironești) (Google Earth Pro)

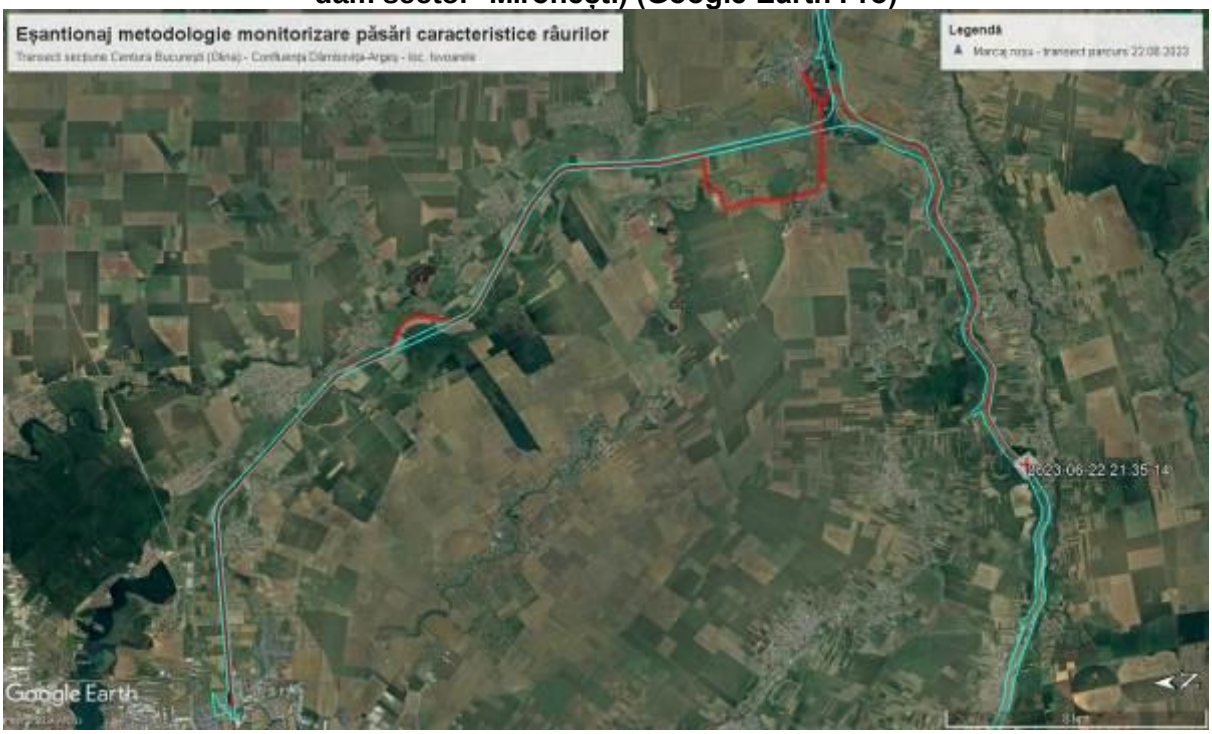


Figure no. 73 - Sampling for the assessment of bird species characteristic of rivers (Sector Bucharest Ring Road (Glina) - Dâmbovița-Argeș Confluence - Isvoarele) (Google Earth Pro)



Figure no. 74 - Sampling for the assessment of bird species characteristic for rivers (Dâmbovița-Argeș Confluence - Argeș-Dunăre Confluence) (Google Earth Pro).



Figure no. 75 - Sampling for the assessment of bird species during the winter/autumn migration period and the boundaries of the Natura 2000 sites overlain by the project (Google Earth Pro)

Field surveys over the 3 seasons revealed a total of **105 bird species**.

A number of 25 species are included in Annex I of the Birds Directive, with point-like localisations along the Argeș and Dâmbovița rivers, which indicates the need to apply impact prevention measures, especially in areas with small surfaces, which maintain a minimum of favourable conditions for species of Community importance, which are mentioned in the context of the study.

The list of species fully identified during the 3 monitoring periods is summarised in Table 27.

Table no. 31 - List of bird species present in the proximity and perimeter of the project during the year

No.	Species	Annex Directive 2009/147/EEC	Annex GEO No 57/2007	No. of individuals / pairs	Phenology	Season (PM/AM/C)
1.	*Accipiter gentilis*	-	-	1 i.	S	AM
2.	*Accipiter nisus*	-	-	2 i.	S	AM, PM
3.	*Acrocephalus arundinaceus*	-	-	10 i., 18 p.	OV	AM, PM, C
4.	*Acrocephalus palustris*	-	-	2 p.	OV	C
5.	*Acrocephalus schoenobaenus*	-	-	6 i.	OV	AM, C
6.	*Actitis hypoleucos*	-	-	4 i.	P	AM, PM, C
7.	*Aegithalos caudatus*	-	-	15 i.	S	AM, PM
8.	*Alauda arvensis*	II	5C	6 i. 2 p.	OV	AM, PM, C
9.	*Alcedo atthis*	I	3	9 i. 3 p.	S	AM, PM, C
10.	*Anas clypeata*	II	5C	4 i.	S	PM, C
11.	*Anas crecca*	II	5C	30 i.	S	AM, PM, C
12.	*Anas platyrhynchos*	II	5C	189 i.	S	AM, PM, C
13.	*Anas strepera*	II	5C	8 i., 1 p.	S	AM, PM, C
14.	*Anas querquedula*	II	5C	14 i.	OV	PM
15.	*Anthus campestris*	I	3	3 p.	OV	C
16.	*Apus apus*	-	-	22 i.	OV	C
17.	*Ardea cinerea*	-	-	19 i.	S	AM, PM, C
18.	*Ardea purpurea*	I	3	3 i.	OV	C
19.	*Ardeola ralloides*	I	3	3	OV	AM
20.	*Aythya ferina*	II	5C	30	OV	AM, PM
21.	*Aythya nyroca*	I	3	5 p., 32	OV	AM, PM, C

No.	Species	Annex Directive 2009/147/EEC	Annex GEO No 57/2007	No. of individuals / pairs	Phenology	Season (PM/AM/C)
22.	*Buteo buteo*	-	-	7 i.	S	AM, PM
23.	*Calidris temminckii*	-	-	2 i.	P	PM
24.	*Carduelis carduelis*	-	4B	132 i., 32 p.	S	PM, AM, C
25.	*Casmerodius albus*	I	3	3 i.	P	C
26.	*Charadrius dubius*	-	-	4 i., 2 p.	P	PM, AM, C
27.	*Chloris chloris*	-	4B	2 i., 1 p.	S	AM, C
28.	*Chlidonias hybridus*	I	3	44 i.	P	C
29.	*Ciconia ciconia*	I	3	8 i. 3 p.	OV	PM
30.	*Circus aeruginosus*	I	3	2 i.	OV	PM
31.	*Circus cyaneus*	I	3	1	OI	PM
32.	*Columba palumbus*	II	5C	178 i., 34 p.	S	AM, PM, C
33.	*Coracias garrulus*	I	3	3 p.	OV	C
34.	*Corvus frugilegus*	II	5C	742 i.	S	AM, PM, C
35.	*Corvus monedula*	II	5C	16	S	AM, PM
36.	*Cuculus canorus*	-	-		OV	C
37.	*Cyanistes caeruleus*	-	-	23 i. 12 p.	S	AM, PM, C
38.	*Cygnus olor*	-	-	73 i., 2 p.	S	AM, PM, C
39.	*Delichon urbica*	-	-	84 i., 120 i.	OV	PM, C
40.	*Dendrocopos major*	-	-	6 i., 4 i.	S	AM, PM, C
41.	*Dendrocopos medius*	I	3	1 i.	S	AM
42.	*Dryocopus martius*	I	3	2 i.	S	AM, PM
43.	*Egretta garzetta*	I	3	12 i., 14 i.	OV	AM, C
44.	*Erithacus rubecula*	-	4B	16 i., 13 p.	OV	AM, PM, C
45.	*Falco tinnunculus*	-	4B	11 i., 7 i.	S	AM, PM, C
46.	*Falco subbuteo*	-	4B	1 i.	OV	PM
47.	*Ficedula albicollis*	I	3	3 i.	OV	PM
48.	*Ficedula hypoleuca*	-	-	2 i.	OV	AM
49.	*Fringilla coelebs*	-	-	105 i., 24 p.	S	AM, PM, C
50.	*Fulica atra*	II	5C	51 i., 24 i.	S	AM, PM, C
51.	*Galerida cristata*	-	-	4 i., 1 p.	S	AM, C
52.	*Gallinula chloropus*	II	5C	4 i., 4 p.	OV	AM, PM, C
53.	*Garrulus glandarius*	II	5C	10 i., 4 p.	S	AM, PM, C
54.	*Haliaeetus albicilla*	I	3	1 i.	S	PM
55.	*Himantopus himantopus*	I	3	2 i., 4 i.	P	PM, C
56.	*Hirundo rustica*	-	-	194 i., 175 i.	OV	PM, C
57.	*Lanius collurio*	I	3	12 i.	OV	AM
58.	*Lanius minor*	I	3	5 p.	OV	C
59.	*Larus cachinnans*	-	-	24 i., 16 i.	S	PM, C
60.	*Larus ridibundus*	-	-	301 i., 22 i.	S	AM, PM, C
61.	*Locustella luscinioides*	-	-	2 i., 6 i.	OV	AM, C
62.	*Luscinia luscinia*	-	-	2 p.	OV	C
63.	*Luscinia megarhynchos*	-	-	29 p.	OV	C
64.	*Merops apiaster*	-	-	140 p.	OV	C
65.	*Miliaria calandra*	-	4B	46 i., 25 p.	S	AM, PM, C
66.	*Motacilla alba*	-	4B	36 i.	OV	AM, PM
67.	*Motacilla flava*	-	4B	15 i., 14 p.	OV	AM, C
68.	*Muscicapă striata*	-	4B	2 i., 3 p.	OV	AM, PM, C
69.	*Oenanthe oenanthe*	-	-	1 i.	OV	PM
70.	*Oriolus oriolus*	-	-	20 p.	OV	C
71.	*Parus major*	-	-	164 i., 38 p.	S	AM, PM, C
72.	*Poecile palustris*	-	-	4 i.	S	C
73.	*Passer domesticus*	-	-	26 i.	S	AM, PM
74.	*Passer montanus*	-	-	109 i.	S	AM, PM, C
75.	*Pelecanus crispus*	I	3	4 i.	OV	AM
76.	*Phalacrocorax carbo*	-	-	122 i., 22 i.	S	AM, PM, C
77.	*Phasianus colchicus*	II/III	5C, E	11 i., 6 i.	S	AM, PM, C
78.	*Phalacrocorax pygmeus*	I	3	29 i., 27 i.	OV	AM, PM, C
79.	*Philomachus pugnax*	I	3	3 i.	P	AM
80.	*Phoenicurus phoenicurus*	-	-	1 p.	OV	C
81.	*Phylloscopus collybita*	-	4B	54 i., 16 p.	OV	AM, PM, C
82.	*Phylloscopus sibilatrix*	-	4B	2 i.	OV	PM
83.	*Phylloscopus trochilus*	-	4B	1 i.	OV	AM

No.	Species	Annex Directive 2009/147/EEC	Annex GEO No 57/2007	No. of individuals / pairs	Phenology	Season (PM/AM/C)
84.	*Pica pica*	II	5C	112 i., 42 p.	S	AM, PM, C
85.	*Plegadis falcinellus*	I	3	19 i.	OV	C
86.	*Podiceps cristatus*	-	-	6 i., 4 i.	S	AM, PM, C
87.	*Remiz pendulinus*	-	-	7 i., 88 p.	S	PM, AM, C
88.	*Riparia riparia*	-	-	60 i., 78 p.	OV	PM, C
89.	*Saxicola rubetra*	-	-	2 i., 2 p.	OV	AM, C
90.	*Sterna hirundo*	I	3	4 i.	OV	C
91.	*Streptopelia decaocto*	II	5C	12 i.	S	AM
92.	*Streptopelia turtur*	II	5C	2 p.	OV	C
93.	*Sturnus vulgaris*	II	5C	83 i., 230 i.	S	PM, C
94.	*Sylvia atricapilla*	-	-	4 p.	OV	C
95.	*Sylvia communis*	-	-	1 i., 4 p.	OV	AM, C
96.	*Sylvia curruca*	-	-	1 i.	OV	AM
97.	*Tachybaptus ruficollis*	-	-	1 i., 1 p.	S	AM, C
98.	*Tringa glareola*	I	3	3 i.	P	PM, C
99.	*Tringa ochropus*	-	-	27 i., 2 i.	P	AM, PM, C
100.	*Tringa totanus*	-	-	4 i.	P	AM, PM
101.	*Tringa stagnatilis*	-	-	1 i.	P	PM
102.	*Turdus merula*	-	-	26 i., 17 p.	S	AM, PM, C
103.	*Turdus philomelos*	-	-	1 i.	S	PM
104.	*Upupa epops*	-	4B	7 i., 12 p.	OV	AM, PM, C
105.	*Vanellus vanellus*	-	-	56 i., 15 i.	OV	AM, PM, C

The results of the seasonal investigations are presented below.

5.4.3.1 Bird populations characteristic of rivers (vernal period)

For each trip, the transects were travelled in their entirety, and recordings were made at the monitoring stations for 15-30 minutes between 07.00 AM and 19.00 PM, noting each species observed and the flocks present.

Following the field surveys of bird species characteristic of rivers during the 4 days in June 2023, 75 bird species categorised into the following general habitat types were identified:

- Species of aquatic and marshy habitats – 33 species, of which, in terms of phenological status, 15 species are summer visitors (SV), 4 species are passage migrants (PM), and 14 species are sedentary (S);
- Species of open terrestrial habitats, arable land, grassland, floodplain, pastures and scrublands - 28 species, of which, in terms of phenological status, 17 species are summer visitors (SV) and 11 species are sedentary (S);
- Forest habitat species - 14 species, of which, in terms of phenological status, 7 species are summer visitors (SV) and 7 are sedentary species (S).

Out of the total of 75 bird species identified along the entire project route, during the application of the nesting period methodology on species characteristic of rivers and aquatic habitats, a total of **33 species of waterbird species** were recorded, **of which 12 species are included in Annex I of the Birds Directive 79/409/EEC**, and out of the total of 75 species only 15 are species of Community importance, and 3 species are characteristic of terrestrial habitats, resulting in a number of about 60 species of common birds without high conservation importance, which shows the low attractiveness of bird species for the Argeș and Dâmbovița rivers, but with point preferences at their level, of which we mention 8 critical areas:

1. The Bucharest Ring Road - Glina area, popularly known as the "Glina Delta";
2. Tătaru Fish Farm area, near Plătărești;
3. Dâmbovița-Argeș confluence area;
4. Mihăilești Dam - Argeș area;
5. Neajlov-Argeș confluence area;

6. The area of the Argeș river course in the sector of Șoldanu - bridge over national road DJ403;
7. Area of the Argeș river sector between Curcani-Clătești;
8. Argeș-confluence with the Danube area.

The description of these areas with the project maps can be found in point 6.6.4. – impact on biodiversity.

The list of combined species for the two rivers Argeș and Dâmbovița is presented in Table 28.

Table no. 32 - List of bird species characteristic for the habitats of flowing waters identified in the project area

No.	Species code	Species	No ind./pop.	Annex Directive 79/409/EEC	GEO 57/2007	Phenology	Identification type
1.	A298	*Acrocephalus arundinaceus*	18 p.	-	-	SV	Field observations
2.	A296	*Acrocephalus palustris*	2 p.	-	-	SV	Field observations
3.	A295	*Acrocephalus schoenobaenus*	2 p.	-	-	SV	Field observations
4.	A168	*Actitis hypoleucos*	1 i.	-	-	P	Field observations
5.	A247	*Alauda arvensis*	2 p.	II	5C	SV	Field observations
6.	A229	*Alcedo atthis*	3 p.	I	3	S	Field observations
7.	A056	*Anas clypeata*	4 i.	II	5C	S	Field observations
8.	A052	*Anas crecca*	10 i.	II	5C	S	Field observations
9.	A053	*Anas platyrhynchos*	34 i.	II	5C	S	Field observations
10.	A051	*Anas strepera*	1 p.	II	5C	S	Field observations
11.	A255	*Anthus campestris*	3 p.	I	3	SV	Field observations
12.	A226	*Apus apus*	22 i.	-	-	SV	Field observations
13.	A028	*Ardea cinerea*	9 i.	-	-	S	Field observations
14.	A029	*Ardea purpurea*	3 i.	I	3	SV	Field observations
15.	A060	*Aythya nyroca*	5 p.	I	3	SV	Field observations
16.	A364	*Carduelis carduelis*	75 i.	-	4B	S	Field observations
17.	A363	*Carduelis chloris*	1 p.	-	4B	S	Field observations
18.	A027	*Casmerodius albus*	3 i.	I	3	S	Field observations
19.	A136	*Charadrius dubius*	4 i.	-	-	P	Field observations
20.	A196	*Chlidonias hybridus*	44 i.	I	3	SV	Field observations
21.	A031	*Ciconia ciconia*	6 i.	I	3	SV	Field observations
22.	A208	*Columba palumbus*	34 p.	II	5C	S	Field observations
23.	A231	*Coracias garrulus*	3 i.	I	3	SV	Field observations
24.	A348	*Corvus frugilegus*	27 i.	II	5C,D	S	Field observations
25.	A212	*Cuculus canorus*	26 p.	-	-	SV	Field observations
26.	A483	*Cyanistes caeruleus*	12 p.	-	-	S	Field observations
27.	A036	*Cygnus olor*	2 p.	-	-	S	Field observations
28.	A253	*Delichon urbica*	120 i.	-	-	SV	Field observations
29.	A237	*Dendrocopos major*	4 i.	-	-	S	Field observations
30.	A026	*Egretta garzetta*	14 i.	I	3	SV	Field observations
31.	A269	*Erithacus rubecula*	13 p.	-	4B	SV	Field observations
32.	A096	*Falco tinnunculus*	7 i.	-	4B	S	Field observations
33.	A359	*Fringilla coelebs*	24 p.	-	4B	S	Field observations
34.	A125	*Fulica atra*	24 i.	II	5C	S	Field observations
35.	A123	*Gallinula chloropus*	4 p.	II	5C	SV	Field observations
36.	A244	*Galerida cristata*	1 p.	-	-	S	Field observations
37.	A342	*Garrulus glandarius*	4 p.	II	5C,D	S	Field observations
38.	A131	*Himantopus himantopus*	4 i.	I	3	SV	Field observations
39.	A251	*Hirundo rustica*	175 i.	-	-	SV	Field observations
40.	A339	*Lanius minor*	5 p.	I	3	SV	Field observations
41.	A359	*Larus cachinnans*	16 i.	-	-	S	Field observations
42.	A179	*Larus ridibundus*	22 i.	-	-	S	Field observations
43.	A292	*Locustella luscinioides*	6 i.	-	-	SV	Field observations
44.	A270	*Luscinia luscinia*	2 p.	-	-	SV	Field observations
45.	A271	*Luscinia megarhynchos*	29 p.	-	-	SV	Field observations
46.	A230	*Merops apiaster*	140 p.	-	-	SV	Field observations
47.	A383	*Miliaria calandra*	25 p.	-	4B	S	Field observations
48.	A260	*Motacilla flava*	14 p.	-	4B	SV	Field observations
49.	A319	*Muscicapă striata*	3 p.	-	-	SV	Field observations
50.	A337	*Oriolus oriolus*	20 p.	-	-	SV	Field observations
51.	A330	*Parus major*	38 p.	-	-	S	Field observations

No.	Species code	Species	No ind./pop.	Annex Directive 79/409/EEC	GEO 57/2007	Phenology	Identification type
52.	A356	*Passer montanus*	95 i.	-	-	S	Field observations
53.	A493	*Poecile palustris*	4 i.	-	-	S	Field observations
54.	A017	*Phalacrocorax carbo*	22 i.	-	-	S	Field observations
55.	A115	*Phasianus colchicus*	6 i.	II	5C,E	S	Field observations
56.	A393	*Microcarbo pygmeus*	27 i.	I	3	SV	Field observations
57.	A274	*Phoenicurus phoenicurus*	1 p.	-	4B	SV	Field observations
58.	A315	*Phylloscopus collybita*	16 p.	-	4B	SV	Field observations
59.	A343	*Pica pica*	42 p.	II	5C	S	Field observations
60.	A032	*Plegadis falcinellus*	19 i.	I	3	SV	Field observations
61.	A005	*Podiceps cristatus*	4 i.	-	-	S	Field observations
62.	A336	*Remiz pendulinus*	88 p.	-	-	SV	Field observations
63.	A249	*Riparia riparia*	78 p.	-	-	SV	Field observations
64.	A275	*Saxicola rubetra*	2 p.	-	-	SV	Field observations
65.	A193	*Sterna hirundo*	4 i.	I	3	SV	Field observations
66.	A210	*Streptopelia turtur*	2 p.	-	-	SV	Field observations
67.	A351	*Sturnus vulgaris*	230 i.	II	5C	S	Field observations
68.	A311	*Sylvia atricapilla*	4 p.	-	-	SV	Field observations
69.	A309	*Sylvia communis*	4 p.	-	-	SV	Field observations
70.	A004	*Tachybaptus ruficollis*	1 p.	-	-	S	Field observations
71.	A166	*Tringa glareola*	2 i.	I	3	P	Field observations
72.	A165	*Tringa ochropus*	2 i.	-	-	P	Field observations
73.	A283	*Turdus merula*	17 p.	-	-	S	Field observations
74.	A232	*Upupa epops*	12 p.	-	-	SV	Field observations
75.	A142	*Vanellus vanellus*	15 i.	II	-	SV	Field observations

Legend: SV - summer visitor; P - passage; S - sedentary.

The following figures show some of the relevant images from the field investigations (Figs 76-110).



Figure no. 76 - Small Egret *(Egretta garzetta*), in the area of Mihăilești dam



Figure no. 77 - Argeș river in June, Pruni area



Figure no. 78 - Argeș river in June, 1 Decembrie-Adunații-Copăceni area



Figure no. 79 - Argeș river in June, Grădiștea area



Figure no. 80 - Argeș river in June, Falaștoaca - Lock area



Figure no. 81 - Argeș River in June, Argeș-Neajlov Confluence



Figure no. 82 - Argeș river in June, Mironești area



Figure no. 83 - Argeș river in June, Hotarele-DJ401 bridge area



Figure no. 84 - Argeș River in June, Argeș-confluence with the Dâmbovița river



Figure no. 85 - Argeș river in June, area of Șoldanu-DJ403 bridge area



Figure no. 86 - Argeș river in June, Oltenița-DN41 bridge area



Figure no. 87 - Argeș river in June, Oltenița - Lock area



Figure no. 88 - Argeș River in June, Argeș-confluence with the Danube



Figure no. 89 - Dâmbovița River in June, Bucharest - Glina ring road area



Figure no. 90 - Dâmbovița River in June, Colentina-confluence with the Dâmbovița river area



Figure no. 91 - Dâmbovița river in June, Bălăceanca dam area



Figure no. 92 - Dâmbovița river in June, Pasărea - Dâmbovița river confluence area



Figure no. 93 - Dâmbovița river in June, DJ412 bridge-Vasilați area



Figure no. 94 - Dâmbovița river in June, Budești pumping station area



Figure no. 95 - Blue Tit *(Cyanistes caeruleus*), in the Argeș-confluence with the Danube area (photo: Mihai Avedic)



**Figure no. 96 - Great cormorants *(Phalacrocorax carbo*) and small cormorants *(Microcarbo pygmeus*),
in the area of Oltenița - Lock (photo: Mihai Avedic)**



Figure no. 97 - Small egret*(Egretta garzetta*), in the area of Oltenița - Lock (photo: Mihai Avedic)



Figure no. 98 - Barn swallows *(Hirundo rustica*), in the area of Oltenița-DN41 bridge (photo: Mihai Avedic)



Figure no. 99 - White stork *(Ciconia ciconia*) feeding on the banks of the Argeș river in the area of Curcani (photo: Mihai Avedic)



Figure no. 100 - Lesser grey shrike *(Lanius minor*), in the area of Curcani (photo: Mihai Avedic)



**Figure no. 101 - Yellow wagtail *(Motacilla flava*),
in the area of Curcani (photo: Mihai Avedic)**



Figure no. 102 - Hoopoe *(Upupa epops*) in the area of Curcani (photo: Mihai Avedic)



Figure no. 103 - Colony of sand martins *(Riparia riparia*) in the area of Șoldanu (photo: Mihai Avedic)



Figure no. 104 - Caspian gulls *(Larus cachinnans*), in the area of Negoești (photo: Mihai Avedic)



Figure no. 105 - Nest and individuals of Eurasian penduline tits *(Remiz pendulinus*), in the area of Negoești and Hotarele (photo: Mihai Avedic)



Figure no. 106 - Green sandpiper *(Tringa ochropus*) in the area of Crivăț (photo: Mihai Avedic)



Figure no. 107 - Little ringed plover *(Charadrius dubius*), in the area of Hotarele (photo: Mihai Avedic)



Figure no. 108 - Glossy ibis *(Plegadis falcinellus*) in a passage in the area of Vasilați (photo: Mihai Avedic)



Figure no. 109 - Grey heron *(Ardea cinerea*) and small cormorant *(Microcarbo pygmeus*), in the Colentina-confluence with the Dâmbovița river area (photo: Mihai Avedic)



Figure no. 110 - Black-headed gulls *(Larus ridibundus*), lapwings *(Vanellus vanellus*) and Eurasian coots *(Fulica atra*), in the Bucharest -ring road Glina area (photo: Mihai Avedic)

- **Tătaru fish farm**

In the area of the Tătaru fishpond, various species of aquatic birds of community importance have been observed during the last 5 years, through observations carried out by professionals and amateurs, but mainly by representatives of the Tătaru fishpond administration (Fig. 111-114). These include species such as the Dalmatian pelican *(Pelecanus crispus*), spoonbill (*Platalea leucorodia*), black-winged stilt *(Himantopus himantopus*), black-crowned night heron *(Nycticorax nycticorax*) and whiskered tern ducks *(Chlidonias hybridus*), which nest or are in passage and foraging in the area of the fish farm, most of which are species of Community importance included in Annex I of Directive 79/409/EEC on the conservation of wild bird species. In addition to the aquatic species mentioned above, the forest habitat bordering the fish farm also ports species of Community importance such as the black woodpecker*(Dryocopus martius*), the collared flycatcher *(Ficedula albicollis*), the long-legged buzzard *(Buteo rufinus*) and the middle spotted woodpecker *(Dendrocopos medius*).

During the 5 years of observations in the area of Tătaru pool, 172 bird species were recorded, of which no less than 44 species are included in Annex I of the Birds Directive, which **leads to the proposal of measures to divert the proposed route of the project to establish the Argeș-Dâmbovița-Danube navigable canal**, so that it does not produce disastrous effects on the existing fauna in the perimeter of the fish farm and the adjacent forest habitat.



Figure no. 111 - Dalmatian pelicans *(Pelecanus crispus*) in the passage, in the area of the Tătaru fish farm (photo: Doru Panaitescu)



Figure no. 112 - Spoonbills *(Platalea leucorodia*) in passage, in the area of the Tătaru fish farm (photo: Doru Panaitescu)



Figure nr. 113 - Colony of black-winged stilts *(Himantopus himantopus*), in the area of the Tătaru fish farm (photo: Doru Panaitescu)



Figure no. 114 - Black-crowned night heron *(Nycticorax nycticorax*) and whiskered tern ducks *(Chlidonias hybridus*), in the area of Tătaru fish farm (photo: Doru Panaitescu)

5.4.3.2 Prevernal and autumn migratory birds

For a better centralisation of the bird species identified in both prevernal and autumn migration seasons, all the bird species were filled in for each station (VP01_VP70) with the mention of the migration season in which they were identified, in order to establish possible measures to avoid or prevent possible forms of impact that may occur on the species (detailed results of the field investigations are given in Annex no. 11). At the same time, the highest flock number between the two seasons was taken into account, so that a maximum and a minimum flock number could be considered for each station.

Out of the total of 86 bird species identified during the field surveys, 17 species are listed in Annex I of Directive 2009/147/EEC, but in low numbers.

In terms of phenological status, 34 species are summer visitors (SV), 9 are in passage (P), 1 is a winter visitor (WV) and 42 are sedentary (S).

In terms of presence, 47 out of the 85 species were observed in both migration seasons, indicating their possible presence between the two periods, while species identified exclusively during the autumn migration (AM) are present either permanently - sedentary or only from May to September (Table 29).

The most important areas for the presence of bird species are the same 8 areas mentioned for the vernal period.

The same diversity is maintained in these areas, similar to the nesting period (May-June) (tab. 33).

Table no. 33 - List of bird species present in the vicinity and perimeter of the project during the prevernal (PM) and autumn (AM) migration seasons

No.	Species	Annex Directive 2009/147/EEC	Annex GEO No 57/2007	No. individuals	Phenology	Season (PM/AM)
1.	*Accipiter gentilis*	-	-	1	S	AM
2.	*Accipiter nisus*	-	-	2	S	AM, PM
3.	*Acrocephalus arundinaceus*	-	-	10	SV	AM, PM
4.	*Acrocephalus schoenobaenus*	-	-	6	SV	AM
5.	*Actitis hypoleucos*	-	-	4	P	AM, PM
6.	*Aegithalos caudatus*	-	-	15	S	AM, PM
7.	*Alauda arvensis*	II	5C	6	SV	AM, PM
8.	*Alcedo atthis*	I	3	9	S	AM, PM
9.	*Anas clypeata*	II	5C	4	S	PM
10.	*Anas crecca*	II	5C	30	S	AM, PM
11.	*Anas platyrhynchos*	II	5C	189	S	AM, PM
12.	*Anas strepera*	II	5C	8	S	AM, PM
13.	*Anas querquedula*	II	5C	14	SV	PM
14.	*Ardea cinerea*	-	-	19	S	AM, PM
15.	*Ardeola ralloides*	I	3	3	SV	AM
16.	*Aythya ferina*	II	5C	30	SV	AM, PM
17.	*Aythya nyroca*	I	3	32	SV	AM, PM
18.	*Buteo buteo*	-	-	7	S	AM, PM
19.	*Calidris temminckii*	-	-	2	P	PM
20.	*Carduelis carduelis*	-	4B	132	S	MP, MA
21.	*Charadrius dubius*	-	-	4	P	MP, MA
22.	*Chloris chloris*	-	4B	2	S	AM
23.	*Ciconia ciconia*	I	3	8	SV	PM
24.	*Circus aeruginosus*	I	3	2	SV	PM
25.	*Circus cyaneus*	I	3	1	OI	PM
26.	*Columba palumbus*	II	5C	178	S	AM, PM
27.	*Corvus frugilegus*	II	5C	742	S	AM, PM
28.	*Corvus monedula*	II	5C	16	S	AM, PM
29.	*Cyanistes caeruleus*	-	-	23	S	AM, PM
30.	*Cygnus olor*	-	-	73	S	AM, PM
31.	*Delichon urbica*	-	-	84	SV	PM
32.	*Dendrocopos major*	-	-	6	S	AM, PM
33.	*Dendrocopos medius*	I	3	1	S	AM
34.	*Dryocopus martius*	I	3	2	S	AM, PM
35.	*Egretta garzetta*	I	3	12	SV	AM
36.	*Erithacus rubecula*	-	4B	16	SV	AM, PM
37.	*Falco tinnunculus*	-	4B	11	S	AM, PM
38.	*Falco subbuteo*	-	4B	1	SV	PM
39.	*Ficedula albicollis*	I	3	3	SV	PM
40.	*Ficedula hypoleuca*	-	-	2	SV	AM
41.	*Fringilla coelebs*	-	-	105	S	AM, PM
42.	*Fulica atra*	II	5C	51	S	AM, PM
43.	*Galerida cristata*	-	-	4	S	AM
44.	*Gallinula chloropus*	II	5C	4	SV	AM, PM
45.	*Garrulus glandarius*	II	5C	10	S	AM, PM
46.	*Haliaeetus albicilla*	I	3	1	S	PM
47.	*Himantopus himantopus*	I	3	2	P	PM
48.	*Hirundo rustica*	-	-	194	SV	PM

No.	Species	Annex Directive 2009/147/EEC	Annex GEO No 57/2007	No. individuals	Phenology	Season (PM/AM)
49.	*Lanius collurio*	I	3	12	SV	AM
50.	*Larus cachinnans*	-	-	24	S	PM
51.	*Larus ridibundus*	-	-	301	S	AM, PM
52.	*Locustella luscinioides*	-	-	2	SV	AM
53.	*Miliaria calandra*	-	4B	46	S	AM, PM
54.	*Motacilla alba*	-	4B	36	SV	AM, PM
55.	*Motacilla flava*	-	4B	15	SV	AM
56.	*Muscicapă striata*	-	4B	2	SV	AM, PM
57.	*Oenanthe oenanthe*	-	-	1	SV	PM
58.	*Parus major*	-	-	164	S	AM, PM
59.	*Passer domesticus*	-	-	26	S	AM, PM
60.	*Passer montanus*	-	-	109	S	AM, PM
61.	*Pelecanus crispus*	I	3	4	SV	AM
62.	*Phalacrocorax carbo*	-	-	122	S	AM, PM
63.	*Phasianus colchicus*	II/III	5C, E	11	S	AM, PM
64.	*Phalacrocorax pygmeus*	I	3	29	SV	AM, PM
65.	*Philomachus pugnax*	I	3	3	P	AM
66.	*Phylloscopus collybita*	-	4B	54	SV	AM, PM
67.	*Phylloscopus sibilatrix*	-	4B	2	SV	PM
68.	*Phylloscopus trochilus*	-	4B	1	SV	AM
69.	*Pica pica*	II	5C	112	S	AM, PM
70.	*Podiceps cristatus*	-	-	6	S	AM, PM
71.	*Remiz pendulinus*	-	-	7	S	MP, MA
72.	*Riparia riparia*	-	-	60	SV	PM
73.	*Saxicola rubetra*	-	-	2	SV	AM
74.	*Streptopelia decaocto*	II	5C	12	S	AM
75.	*Sturnus vulgaris*	II	5C	83	S	PM
76.	*Sylvia communis*	-	-	1	SV	AM
77.	*Sylvia curruca*	-	-	1	SV	AM
78.	*Tachybaptus ruficollis*	-	-	1	S	AM
79.	*Tringa glareola*	I	3	3	P	PM
80.	*Tringa ochropus*	-	-	27	P	AM, PM
81.	*Tringa totanus*	-	-	4	P	AM, PM
82.	*Tringa stagnatilis*	-	-	1	P	PM
83.	*Turdus merula*	-	-	26	S	AM, PM
84.	*Turdus philomelos*	-	-	1	S	PM
85.	*Upupa epops*	-	4B	7	SV	AM, PM
86.	*Vanellus vanellus*	-	-	56	SV	AM, PM

The following photos show selectively some of the bird species from Annex I of the Birds Directive, observed in the field at various vantage points (Figs 115-120).



Figure no. 115 - Ferruginous duck *(Aythya nyroca*) at VP1 (PM) (Argeș River, Mihăilești dam) (Photo: Mihai Avedic)



Figure no. 116 - Small cormorants *(Phalacrocorax pygmeus*), 300 m upstream of VP6 (PM) (Photo: Mihai Avedic)



Figure no. 117 - Small egret *(Egretta garzetta*), at VP40 (AM) (Photo: Mihai Avedic)



Figure no. 118 - Lapwings *(Vanellus vanellus*) and ruffs *(Philomachus pugnax*), at VP42 (AM) (Photo: Mihai Avedic)



Figure no. 119 - Hen harrier *(Circus cyaneus*), ♀at VP64 (PM) (Photo: Mihai Avedic)



Figure no. 120 - White stork (*Ciconia ciconia*) at VP67 (PM) (Photo: Mihai Avedic)

5.4.4. Herpetofauna

The identification of amphibian and reptile species in the project perimeter was carried out following the same type of sampling used in the identification of bird species in the migratory season, by establishing monitoring stations and travelling from one point to another (Fig. 4), where the stationing time was 15-30 minutes, during which time the river banks, nearby pools (if any) and meadow forests on the river banks were checked, and the trip was done during the same optimal period for species presence, i.e. 21-24 June 2023 and 20-23 September 2023.

A total of 8 species of amphibians and reptiles were recorded during the two periods of the field surveys, i.e. June and September 2023, of which 1 species of Community importance whose conservation requires the designation of special conservation areas, the pond turtle *(Emys orbicularis*), which has been identified only in 3 key areas, monitoring station 5, on the right bank of the Argeș river, between Novaci and Dărăști-Vlașca, monitoring station 54, Dâmbovița river area, Ring Road-Glina, and monitoring station 63, Tătaru fish farm, near Plătărești.

The remaining species, namely the green toad *(Bufotes viridis*), the green lizard *(Lacerta viridis*), the dice snake *(Natrix tessellata*) and the Caspian whipsnake *(Dolichophis caspius*) are of Community importance, most of them listed in Annex 4 of the Habitats Directive, with the most widespread being the green lizard (Figs 121-128).

Table 34 shows the status of surveys of amphibian and reptile species by monitoring stations and the conservation importance of the species according to the legislation in force.

Table no. 34 - List of amphibian and reptile species identified in the field between June and September 2023 on the Argeș and Dâmbovița rivers

No.	Species	Presence of monitoring station	Estimated number of individuals	Annex Directive 92/43/EEC	Annex GEO 57 / 2007
1.	*Pelophylax ridibunda*	1, 2, 3, 5, 12, 18, 32, 37, 40, 44, 45, 51, 54, 63	700-800 i.	5	5A
2.	*Bufotes viridis*	22	5-10 i.	4	4A
3.	*Lacerta viridis*	7, 8, 10, 13	20-30 i.	4	4A
4.	*Emys orbicularis*	5, 54, 63	20-25 i.	2	3
5.	*Trachemys scripta*	54	4-5 i.	-	-
6.	*Natrix tesselata*	2, 8, 63	2-4 i.	4	4A

7.	*Natrix natrix*	5, 63	10-15 i.	-	-
8.	*Dolichophis caspius*	49	5-10 i.	4	4A



Figure no. 121 - Marsh frog*(Pelophylax ridibunda*) (Argeș River - station no. 2) (June 2023)



Figure no. 122 - Green toad *(Bufotes viridis*) (Argeș River - station no. 22) (September 2023)



Figure no. 123 - Green lizard *(Lacerta viridis*) (Argeș River - station no. 13) (June 2023)



Figure no. 124 - Pond turtle*(Emys orbicularis*) (Argeș River - station no. 5) (June 2023)



Figure no. 125 - Pond slider *(Trachemys scripta*) (Dâmbovița River - station no. 54 - Glina) (June 2023)



Figure no. 126 - Dice snake*(Natrix tessellata*) (Argeș River - station no. 8) (September 2023)



Figure no. 127 - Grass snake*(Natrix natrix*) (Dâmbovița River - station no. 63 - Tătaru fish farm)

(September 2023)



Figure no. 128 - Caspian whipsnake*(Dolichophis caspius*) (Argeș River - station no. 49) (September 2023)

The species of amphibians and reptiles identified on the banks of the Argeș and Dâmbovița rivers have a common distribution throughout the perimeter of the proposed project, and the implementation of the project will relocate individuals of species due to the disturbance of the activity by the proposed interventions.

The only species requiring particular attention is the pond turtle *(Emys orbicularis*), found only in the areas of monitoring stations 5, 54 and 63, namely:

- The right bank of the Argeș river, between Novaci and Dărăști-Vlașca;
- The wetland formed on the course of the Dâmbovița river between the Bucharest Ring Road and the Glina Wastewater Treatment Plant;
- Tătaru fish farm on the right bank of the Dâmbovița river, near Plătărești.

5.4.5. Mammals

In order to monitor the mammal species (other than chiropters) present in the area of interest of the project, the application of two types of methodologies was considered, correlated to the standard methodologies presented in the *"Synthetic monitoring guide for mammal species of community interest in Romania, within the project "Monitoring the conservation status of species and habitats in Romania, pursuant to Article 17 of the Habitats Directive", funded by the Sector Operational Programme Environment (SOP Environment)",* but adapted to the actual monitoring conditions both for the structure of the area and the specific climate of arable land, pastures and floodplain, as well as wetlands with riparian vegetation, namely:

- Transect method - it is possible to identify different individuals per transect by measuring fresh tracks on sand or mud (Pop et al. 2013). Thus, data can be treated as presence/absence (similar to the camera-trapping method), or as the absolute number of different individuals identified while travelling along a given transect (Pop et al. 2013). Transects for rodent species present in the project area of interest have a standard length of 1200 metres. Given that the records for small mammal species are small in size (tracks or faeces), a net strip of observations of maximum 10 metres wide (a 5 metre strip on each side of the physical transect, to which the observer has visual access) is considered;
- Signs of presence inventory method - the method consists in looking for signs of presence of the species: tracks, faeces, anal secretions, burrows in the project area;



Figure no. 129 - Location of mammal monitoring stations

Field trips over three seasons took place during the periods: 6-9 April, 21-24 June and 20-23 September 2023, day - light. Transects survey techniques were used at each of the stations analysed (Fig. 129).

The total number of mammal species (excluding Chiroptera) recorded within the perimeter of the proposed project from April to September 2023 at the 69 stations is 16.

Table .... shows the 16 species recorded in the perimeter and neighbourhood of the proposed project, with the number of stations where they have been identified.

The most common species are the mole *(Talpa europaea*), striped field mouse*(Apodemus agrarius*) and ground squirrel *(Spermophilus citellus*). Of the 16 mammal species identified, only **3 are of conservation interest**: the European ground squirrel *(Spermophilus citellus*) present in 26 of the 69 stations and the Eurasian otter *(Lutra lutra*) identified in only 4 stations, probably present all along the Argeș river. Also the European wildcat *(Felis silvestris*) was found in 2 stations (Fig. 130-140, details for each analysed station can be found in Annex 11).

Table no. 35 - Presence of mammal species in the project area

No.	Species	Percentage of stations
1	*Apodemus agrarius*	55.1
2	*Talpa europaea*	73.9
3	*Meles meles*	17.4
4	***Lutra lutra***	5.8
5	*Canis aureus*	2.9
6	*Ondatra zibethicus*	1.4
7	***Spermophilus citellus***	37.7
8	*Sus scropha*	2.9
9	*Vulpes vulpes*	31.9
10	*Mustela nivalis*	4.3
11	*Mustela putorius*	1.4
12	*Lepus europaeus*	1.4
13	*Erinaceus roumanicus*	4.3
14	*Ratus norvegicus*	2.9

15	*Microtus sp.*	2.9
16	***Felis silvestris***	2.9



Figure no. 130 - Badger den (*Meles meles*) and above field mouse nest (*Apodemus* sp.), Station 2 - opposite Cornetu forest, April 2023



Figure no. 131 - Fox (*Vulpes vulpes*) dens on the opposite bank Station 13 - near Mogoșești village - April 2023



Figure no. 132 - Ground squirrel *(Spermophilus citellus*) burrows - station 20 - opposite Gostinari village



Figure no. 133 - Wild boar *(Sus scropha*) tracks, station 35, opposite Budești lock



Figure nr. 134 - Golden jackal *(Canis aureus*) tracks, station 37, upstream Negoiești village





Figure no. 135 - Ground squirrel (*Spermophilus citellus*) burrow



Figure no. 136 - The islands on the Argeș river, accessible only during shallow waters, are biodiversity hotspots for the entire river, station 43, opposite the village of Curcani



Figure no. 137 - Badger*(Meles meles*) tracks, station 43, opposite Curcani locality



Figure no. 138 - Otter (*Lutra lutra*) tracks - centre of the photo, station 43, opposite Curcani locality



Figure no.139 - European wildcat (*Felis silvestris*) tracks, station 43, opposite Curcani locality



Figure no. 140 - Otter*(Lutra lutra*) tracks, station 45, downstream of the bridge in Clătești

- **Great Lake Tataru**

Station (VP) 62 is next to the Great Lake Tataru and the tailrace. The lake is over 30 hectares, wild-looking, flat, surrounded by forest on 2 sides. The tailrace has a natural look and high biodiversity. Both the lake and the tailrace represent an area of high biodiversity, compared to the Dâmbovița river, which has been greatly affected by pollution and anthropogenic interventions. The area could become a reservoir of biodiversity that could colonise the river once the completed treatment plant at Glina has restored the river's water quality and biodiversity (Fig. 141).





Figure no. 141 - Lake Tătaru tailrace (top April, middle June, bottom September 2023)

Identified mammal species: otter *(Lutra lutra*), muskrat *(Ondatra zibethicus*), wildcat *(Felis silvestris*), wild boar *(Sus scropha*), weasel *(Mustela nivalis*) (fig. 142-146).



Figure no. 142 - Otter (*Lutra lutra*) faeces



Picture no. 143 - Wild cat *(Felis silvestris*) (photo Doru Panaitescu)



Figure no. 144 - Wild boar *(Sus scropha*) (photo Doru Panaitescu)



Figure no. 145 - Weasel *(Mustela nivalis*) (photo Doru Panaitescu)



Figure no. 146 - Pictures of Tătaru Lake and Podul Pitarului Forest in the project area

- **Chiroptera**

Bats can be identified by direct contact with the animal (capture), by visual contact or by ultrasound. For species identification, guides are used, which present the morphological features on the basis of which the species can be identified, either in the field or in the laboratory, or the features of the ultrasound emitted.

A bat detector is actually an instrument that converts ultrasound (>20 kHz) into sounds audible to the human ear by processing the ultrasound and passing it into the audible spectrum by slowing down the playback rate of the recording.

A specialised ultrasonic microphone for detecting ultrasound and an Android mobile phone that records the ultrasound were used to detect, record and identify bat species. Using specialised ultrasound analysis software it is possible to identify species recorded by analysing sonograms.

Bat activity is measured by the number of passes. A pass is defined as a continuous sequence of pulses emitted by the bat, lasting 1.5 - 15 sec, as the bat passes by the ultrasonic detector and its acoustic activity is recorded.

Signal characteristics (duration, maximum/minimum frequency, frequency with maximum intensity, etc.) can generally be used to distinguish different species. Recordings were made at fixed points with a duration of 10 minutes/station for each session.

During 3 sessions of 3 days each, recordings were made at 14 stations, 11 of which on the Argeș river and 3 on the Dâmbovița river. The stations were located to cover the entire route and all habitat conditions (Fig. 147).



Figure no. 147 - Location of Chiroptera stations between stations for other groups

Due to a cold spell the overall activity at stations in April 2023 was very low.

Thus, in the 14 stations, checked in 3 seasons, a total of 16 species were found, of which 1 in Annex 2 of the Habitats Directive: ***Myotis myotis*** and one in Annex 3b: ***Vespertilio murinus***. All others are listed in Annex 4 (tab. 36).

Table no. 36 - Presence of Chiroptera species in the perimeter of the proposed project

No.	Species	No. of passes	No. of stations where the species is present out of total number of stations
1	*Nyctalus lasiopterus*	24	7/14
2	*Nyctalus noctula*	148	13/14
3	*Nyctalus leislerii*	5	1/14
4	*Pipistrellus pipistrellus*	13	6/14
5	*Pipistrellus pygmaeus*	9	4/14
6	*Pipistrellus kuhlii*	118	13/14
7	*Pipistrellus nathusii*	102	14/14
8	*Eptesicus serotinus*	16	4/14
9	***Myotis myotis/blythii***	16	7/14
10	*Myotis daubentonii*	8	6/14
11	*Myotis nattereri*	3	3/14
12	*Myotis mystacinus*	1	1/14
13	*Vespertilio murinus*	8	3/14
14	*Hypsugo savii*	2	2/14
15	*Tadarida teniotis*	2	1/14
16	*Plecotus auritus/austriacus*	20	5/14

Table No. 37 Percentage of stations where the species were present and percentage of their passage in relation to the total number of passes.

No.	Species	Percentage of stations (%)	Percentage of passes (%)
1	*Nyctalus lasiopterus*	50	4.8
2	*Nyctalus noctula*	92.8	29.9
3	*Nyctalus leislerii*	7.1	1.0
4	*Pipistrellus pipistrellus*	42.8	2.6
5	*Pipistrellus pygmaeus*	28.6	1.8
6	*Pipistrellus kuhlii*	92.8	23.8
7	*Pipistrellus nathusii*	100	20.6
8	*Eptesicus serotinus*	28.6	0.4
9	***Myotis myotis/blythii***	50	1.6
10	*Myotis daubentonii*	42.8	3.2
11	*Myotis nattereri*	21.4	4.0
12	*Myotis mystacinus*	7.1	3.2
13	*Vespertilio murinus*	21.4	1.6
14	*Hypsugo savii*	14.3	0.2
15	*Tadarida teniotis*	7.1	0.6
16	*Plecotus auritus/austriacus*	35.7	0.4

As can be seen, the most common species is *Pipistrellus nathusii*, present in all 14 stations analysed. It is followed by *Pipistrellus kuhlii* and *Nyctalus noctula*, present in 13 of the 14 stations analysed. In terms of crossing frequency, *Nyctalus noctula* is the most common (almost a third of all recorded passes), followed by *Pipistrellus kuhlii* and *Pipistrellus nathusii*.

The Chiroptera population is well represented in terms of diversity and abundance as a result of favourable environmental conditions, watercourses combined with forests and meadows. The greatest diversity of species is found along the Argeș river at station 25 and at the Argeș river's spill into the Danube. The lowest are in Dâmbovița and some parts of Argeș.

A surprising presence is that of *Tadarida teniotis* (2 passes at one station), a Mediterranean species with uncertain presence in Romania. The nearest cited location of the species is in Bulgaria.

At **station 52, on the Argeș river, at the Danube spillway,** a total of 10 species were identified in 3 seasons, with many passes (Figs. 148-150). The most common species is *Pipistrellus kuhlii*. One species listed in Annex 2 has been identified: ***Myotis myotis***.

In September monitoring was done near the concrete structure that ports colonies of Chiroptera, as follows:

No.	Species	April	June	September
		No. of passes	No. of passes	No. of passes
1	*Pipistrellus nathusii*	-	-	26
2	*Pipistrellus kuhlii*	-	2	59
3	*Myotis daubentonii*	-	2	-
4	***Myotis myotis***	-	-	1
5	*Nyctalus noctula*	-	-	65
6	*Nyctalus lasiopterus*	-	-	6
7	*Pipistrellus pipistrellus*	2	-	-
8	*Plecotus auritus/austriacus*	-	-	4
9	*Pipistrellus pygmaeus*	-	-	3
10	*Eptesicus serotinus*	-	-	7



Figure no. 148 - Concrete structure on the Argeș river just before the spillway used by bats as roosting, possibly also as wintering area



Figure no. 149 - Side view of the concrete structure (left) and the guano deposit under the structure (right)



Figure no. 150 - *Nyctalus noctula* sheltering in the ceiling of the structure

Thus, this project location has been signposted as a more sensitive area for chiropters, which can produce various forms of negative impacts.

5.5 Climate and climate change

This is an area of concern that includes how the project is adapting to the effects of climate change (e.g. changes in extreme temperatures, increased frequency and magnitude of disaster events), but also the extent to which the project is successful in reducing its contribution to climate change, mainly by reducing greenhouse gas emissions.

Significant damage in this case would mean one of the following:

- the occurrence of hazards with particularly serious consequences
- favouring or amplifying the effects of natural hazards with particularly serious consequences
- generating massive greenhouse gas emission rates higher than under baseline conditions.

A detailed analysis of the impact that climate change may have on the project is given in detail in the chapters below.

5.6 Population

Significant human population effects would involve one of the following as a result of project construction and operation:

- Destruction / degradation of a resource on which local communities depend. This may be the case, for example, with water resources: the project may make it impossible to use local water resources or prevent residents from accessing drinking water. Secondary, this may be the case for any other resource (e.g. change of use of land, or definitive occupation of land areas)
- Modifying the ethnic structure of localities by expropriating areas where minorities preponderantly live
- Many local people are leaving their communities either due to expropriation or due to the emergence of some form of impact or risks due to / aggravated by the project implementation (e.g. floods, landslides, etc.).

The communities most at risk are small, resource-dependent, labour-force-challenged, declining ethnic minority communities. There are no such localities in the project area.

5.7 Safety and human health

The significant impairment of human health would imply the occurrence of one of the following situations - as a result of the construction and operation of the project: increased risk of illness as a result of changes in air quality in the sense of increased concentrations of certain pollutants above the maximum permissible limits, according to the legal requirements in force.

Increasing the equivalent noise level in the project implementation areas by exceeding the maximum permissible values, according to the legal requirements in force.

5.8 Material goods

In order to realise this project, it will be necessary to make definitive land occupations, as presented in the previous chapters and detailed in Annex no. 3 to this report.

There will also be land clearing as described in the chapters of this report.

There will be changes in the current state of the construction works executed in the previous phases of the project, as a result of the expert reports, taking into account the state of degradation of these

constructions, some will require demolition, others only rehabilitation works.

This project is based on a study on the status of monuments and archaeological sites in the project area, which also includes the necessary measures to be taken into account during the execution and operation of the project in order to avoid damage to the architectural sites and monuments in the project area.

The requirements of the Authority for Culture and Cultural Heritage concerning the supervision of the works and the obtaining, where appropriate, of archaeological clearance certificates will be respected.

5.9 Landscape

Today the landscape is heavily affected by permanent anthropogenic impacts: abandoned canal constructions, uncontrolled waste, ruderal and invasive vegetation. The construction of the canal would be a long-term benefit for the landscape. Of course, the construction period will present a disturbing phase for the landscape, but it will be of limited duration and will end with the achievement of a natural balance. The landscape will be restored after the completion of the works.

6. Description of the significant effects the project may have on the environment

6.1 Construction and existence of the project, including, where applicable, demolition works

For the execution of the project that is the subject of this impact assessment study report, the table below summarises the works proposed to be carried out, which have been detailed in the previous chapters *(chap. 2.3 Description of the main project characteristics*). Thus, this projects proposes the following:

No.	Type of intervention	Description of the main/secondary and related project interventions during construction, operation and decommissioning stages
1	Dam earthworks	Cutting existing vegetation, removing topsoil.
2	Dam protection works to the canal	Cutting down the vegetation growing through the protection (revetment) previously executed and re-establishing the protection according to the project solutions
3	Navigable fairway rehabilitation works	The works will be carried out in order to ensure navigational depth, and the material obtained will be used to raise the dykes to the heights required in the project.
4	Works to ensure the movement and manoeuvring of ships	Cuttings of river meanders to allow the movement and manoeuvring of ships according to PIANC guidelines.
5	Greening works of the excavated material in Dâmbovița river (known to be polluted)	Earthworks and constructions as detailed in the table below
6	Rehabilitation/restoration of cut-off walls	The sealing works consist in the realisation of cut-off walls in front of the left and right embankment dam for the entire work.
7	Closure works, Argeș canal decommissioning in Budești area	Works to close the dam on the right bank in the Budești area in the event that only the Argeș canal will be built, and the Dâmbovița canal in the 2nd phase, with the Dâmbovița canal to be started during the execution phase with the removal of the closing dike on the Argeș canal

No.	Type of intervention	Description of the main/secondary and related project interventions during construction, operation and decommissioning stages
8	Rehabilitation of waiting ports upstream and downstream of nodes	Remediation/completion works on drilled columns - routing structures, at the waiting ports downstream-upstream of nodes
9	Passenger berths in ports	Equipping ports with pontoons for mooring passenger vessels or yachts
10	Technical berths in ports	Equipping ports with pontoons for maintenance activities, jetties and mooring of vessels for the collection and treatment of bilge water
11	Equipping port platforms	Providing the ports with cranes for handling goods and quay equipment (bitts, access stairs on the embankment, wall recesses for anchoring pedestrian gangways and props recesses)
12	Access to ports on service roads or railway links	Junction arms for access to the ports and railway link to the existing railway transport lines.

Tables 38-39 show the areas that will be deforested inside and outside PNACI, according to the project works. Thus the total deforestation outside PNACI will be about **922761 square metres.**

Table no. 38 - Deforestation/vegetation removal works inside PNACI

No.	Area (m2)	Protected natural area name
Deforestation/Vegetation removal Comana	12040	ROSPA0022 and ROSAC0043 Comana
Deforestation/Vegetation removal Oltenița	181,951 of which forests 119,197	ROSPA0038 Danube-Oltenița

Table no. 39 - Deforestation/vegetation removal works outside PNACI

No.	Area (m2)
CĂLĂRAȘI	
Budești	310993
Crivăț	818
Curcani	449
Mitreni	86988
Radovanu	39096
Șoldanu	38816
Frumușani	159606
Plătărești	28394
Vasilați	57529
GIURGIU	
Herești	17626
Hotarele	3897
Isvoarele	17108
Valea Dragului	52794
Colibași	22902
Adunații Copăceni	42572
Mihăilești	1190
ILFOV	
Dărăști	37128
Măgurele	4855

No.	Area (m2)
TOTAL	**922761**

6.2 Use of natural resources

The main natural resources used in the project are:

- crushed stone, ballast, gravel, sand, earth for fill
- the use of land for permanent occupation with building elements.

According to the expectations, the natural resources will not be significantly affected given the following:

- the quantities of earth and stone used to carry out the works are insignificant in relation to the resources available in Ilfov, Giurgiu and Călărași counties
- during the execution period, approximately 1500 cubic metres of water will be used for wetting the access road during dry weather and for backfilling. This water is provided by the contractor. Regardless of the water source, this amount is insignificant relative to the water volumes of surface and/or groundwater bodies in the project area (as presented in Chapter 4.1.).

Details of the raw materials used in the execution of the works are given in point 2.4.3.

The implementation of the project will not have significant direct effects on the depletion of non-renewable natural resources. Fuels from renewable resources (petroleum products) will be used to run the machines/vehicles involved in the construction / decommissioning activities.

6.3 Emissions of pollutants, noise, vibration, light, heat and radiation, creation of discomfort, waste disposal and recovery

Emissions of physical and chemical pollutants, types of waste generated by the implementation of the project have been presented in chapter 2.8 of this Environmental Impact Assessment. The impact of these emissions will be quantified in the chapter below.

6.4 Safety and human health in the face of major accident hazards and disasters

The production in recent years of significant material and human damage due to the effects of destructive natural phenomena such as floods, landslides or earthquakes, recorded in the production areas with increasingly large areas of land spread over almost the entire territory of Romania, in conjunction with the limited promotion of the works and remedial measures proposed in critical areas and the conservation or slow execution of some works, has led to the need to draw up legal provisions aimed at regulating the occupation of these areas and strategies for implementing measures to defend existing or proposed social and economic objectives in these areas.

According to the current legislation on environmental protection, the projects for the investment works analysed, through the proposed sites, need to comply with the requirements of the national urban planning and zoning plans, regarding land use, protection of human settlements and other objectives of public interest, by analysing the risk areas and implicitly the environmental impact that the proposed sites produce.

In this context, the research of these areas is indispensable, and it requires the determination of the risk categories implied by the location of social-economic objectives of major interest for the country's economy (such as the Danube-Bucharest Canal), the application of appropriate measures and/or the proposal of works to stabilise the effects of phenomena that will lead to limiting the damage and their impact on the environment for existing economic objectives or the protection and encouragement of future investments necessary for economic development in these areas.

6.4.1. Types of risks identified

6.4.1.1 Natural risks

Natural risk zones are geographically defined areas within which there is a potential for natural hazards that can cause physical damage and loss of life, affecting people, human activities, the natural and built environment. In order to propose specific measures for the prevention and mitigation of risks in the studied areas, it is necessary to analyse the causes of the phenomena analysed. In the following we will define only the causes that are of interest for the analysed area.

- *Natural causes:*
  - overflowing watercourses caused by heavy rainfall, sudden snow melt
  - rising groundwater levels
  - collapses of geological massifs
- *Anthropogenic causes:*
  - dam bursting or damage to dams and other works located upstream of the site of social and economic objectives designed at a higher level of importance
  - the design of construction works that cross riverbeds (narrowing watercourses) and that do not take into account existing works or works included in river basin management schemes
  - the design of construction works crossing riverbeds designed at inappropriate or out-of-date maximum flows
  - large-scale deforestation through unregulated logging, etc.

The main concepts that determine the definition of risk areas are:

- *Hazards* - defined as the number of cases of expected occurrence (in a probabilistic sense), during the exposure or observation period, of phenomena that have the potential to cause severe adverse impacts. Hazards can be natural, technological or of a different nature. In addition to natural hazards, it is necessary to consider secondary hazards that are generated in chains of economic and social events that amplify the consequences of natural phenomena.
- *Vulnerability* of the different exposed elements as their susceptibility (in a probabilistic sense) to be affected by the incidence of a severe natural phenomenon (fatalities, construction, disruption or impairment of economic activities). The expected impacts (in a probabilistic sense) are conditioned by the severity of occurrence of the natural phenomena considered.
- The *exposure* of elements to risk is defined as the fraction of the total time they are exposed to certain conditions that make them susceptible to natural events. There are: elements with constant (permanent) exposure such as buildings, elements with variable exposure such as population, etc.

- *Natural risks* are determined by natural hazards, the vulnerability of exposed elements and their exposure. The law highlights at national level the main natural risk areas determined at a given date, where there is a potential for natural disasters through floods, landslides and earthquakes.

- *Natural hazards* are considered to be the most important in the conditions of our country, those determined by the following potential phenomena:
  - floods and flash floods
  - landslides
  - earthquakes.

Each type of risk identified as potential in the project area is analysed below.

6.4.1.2 Flood risk

In order to adopt efficient solutions for the regulation of the lower course of the Argeș River, extensive studies were carried out to determine maximum and minimum water levels under natural conditions and under the modified regime resulting from the impoundment of the Argeș River. The flow velocities calculated for the modified regime, involving embankment and impoundment, under high discharge conditions on the Argeș River, are on the order of 2 to 2.5 m/s, depending on the canal width. These velocities necessitate the implementation of bank protection and stabilization measures.

According to STAS 4068/2-87, the hydraulic design of bridges crossing the Dâmbovița, Sabar, and Ciorogârla rivers, and the Câlnău and Bâldana streams, was performed for a 2% exceedance probability. For the Dâmbovița River, a navigation clearance of 11.00 meters in height was ensured.

The construction of contour dikes for the impoundment steps is intended to safely convey peak discharges corresponding to importance class II, and to protect social and economic assets located within flood-prone areas. According to previous studies, these include approximately 30,000 hectares of agricultural land, 11 settlements with around 6,300 households, approximately 30 economic objectives, and protection of additional objectives identified in regional development plans.

Furthermore, the project ensures water availability for additional uses, made possible by the usable storage volumes created in the reservoirs at NRL (Normal Retention Level), as a result of damming works at the designed impoundment steps. These flows will be used to irrigate up to 100,000 ha of agricultural land, supply drinking water to neighbouring localities, develop further economic objectives. These data are based on prior water balance studies, which indicated that after satisfying discharge requirements for navigation and hydropower generation, sufficient discharges remain to serve other uses within the areas covered by the designed works.

Through additional hydraulic developments planned on the tributaries, aimed at improving flow regimes and integrating these tributaries into the canal system, the project will also provide enhanced flood protection to adjacent flood-prone zones:

- On the Neajlov River, the construction of the non-permanent Comana Reservoir is planned for flood attenuation and flow regulation of Neajlov river downstream, up to the confluence with the designed canal on the Argeș river
- On the Sabar River, as well as on other tributaries, regulation and embankment works are planned to enable their connection with the navigable canal and to mitigate backwater effects from the impoundment steps near the confluence areas.

6.4.1.3 Risk of submersion

The flood protection works designed to safeguard settlements and land against inundation are diverse and include: frontal drainage along dams, counter-channel systems, drainage mattresses/arms at the outer base of dams, water evacuation systems for low-lying zones, as well as drainage systems designed to protect settlements against seepage.

Frontal drainage was designed for intercepting exfiltration (seepage) flows. It is planned for impounded sections where the normal retention level is located above the surrounding terrain, and where local lithological and hydrogeological conditions allow such seepage to occur.

The frontal drainage system captures exfiltration from the impounded river and has been designed as a closed collector system, with drainage pits and filter columns.

The counter-channel ensures the evacuation of water collected from drainage mattresses/arms at the base of the dykes, as well as stormwater runoff from depression areas or from not surveyed valleys and slopes.

6.4.1.4 Seismic risk

From the seismic point of view, according to STAS 11100/1-93 "Seismic macrozonation of Romania", the hydrotechnical node HN1 of Oltenița, the hydrotechnical node HN2 of Budești and the

hydrotechnical node HN3 of Gostinari are classified as macrozones of grade 7_1, and the hydrotechnical node HN4 of Varlam is classified as macrozone of grade 8_1.

According to the "*Seismic Design Code for Buildings"* indicative P100-1/2013, the hydrotechnical nodes HN1 of Oltenița, HN2 of Budești and HN3 of Gostinari are located in the seismic hazard zone corresponding to a ground acceleration (ag) equal to 0.20 g, and the hydrotechnical node HN4 of Varlaam falls in the seismic hazard zone corresponding to a ground acceleration (ag) equal to 0.24 g (for earthquakes with mean recurrence interval (MRI) of 50 and 100 years).

For hydrotechnical node HN1 of Oltenița the related Tc is 1.0 seconds, and for the hydrotechnical node HN2 of Budești, hydrotechnical node HN3 of Gostinari and hydrotechnical node HN4 of Varlaam Tc is 1.6 seconds.

6.4.1.5 Radioactivity

In Ilfov and Giurgiu counties, in the year 2024, there were no exceedances of the warning/alarm limits and no phenomena of radioactive contamination of the environment (the warning limit is 0.250 μg/h). The environment is within the limits of variation of the natural background.

In Călărași County, at the level of 2024, following the global beta radioactivity measurements performed at the Călărași Station, for all environmental factors, no significant increases in radioactivity levels were found.

The values obtained were below the warning limit specific to each environmental factor.

6.4.2. Assessment of the risk of major accidents or damage during construction

The risks of accidents and damage during construction can be grouped as follows:

a) *Risks due to climatic conditions*: rain, storms, fog, lightning, etc., which may prevent machinery and means of transport from working properly or construction technologies from being correctly observed;

b) *Risks as a result of incomplete or inadequate design*, specifications, construction details, which may lead to degradation of various elements of the construction, or even collapse;

c) Technical risks due to machinery and means of transport, through chronic breakdowns, totally accidental causes (explosions, breakages, etc.), lack of maintenance or preventive repair;

d) *Human risks*, which are usually due to insufficient qualifications, consumption of alcoholic beverages, non-compliance with technology and working rules, physical dysfunctions during work (illness, dizziness), etc.

e) *Risks due to wrong decisions* by site management

f) *Combined risks,* due to different, singularly minor, causes or faults, but which synergistically can cause accidents and major damage. They are usually quite numerous and sometimes totally unpredictable.

Potential accident during the execution period

The most common accidents on a construction site are usually caused by non-compliance with safety rules:

- working with machinery and means of transport;
- internal road traffic and access roads;
- fires due to various causes;
- electrocutions, burns, blinding from welding machines
- inhalation of dust or gases

- explosions of oxygen cylinders or other containers from the storage of flammable substances
- landslides or trench collapses
- falls from height or in excavations
- crushing by falling elements
- drowning due to the execution of works on the banks of watercourses.

These types of accidents, with the exception of slope landslides or the triggering of possible landslides, have no impact on the environment, as they are limited in time and space, but they can cause loss of life or disability. They can also have negative economic effects through material losses and delays of works.

Another category of accidents during this period may occur in connection with the local population, which is not used to traffic concentrations induced on access roads or in the area, or through localities. They can also be affected by unfinished or ongoing works, unmarked or without warning signs, large excavations, scaffolding, fallen electrical wires, etc. The victims are usually curious and less well-informed children, attracted by the novelty of the site, and the worst times are the days when no work is being done and access control to work sites is less controlled.

As the construction site is not in residential areas, accidents involving the general public are minimised.

6.4.3. Assessment of the risk of major accidents or damage during operation. Potential accident during the operation period

These accidents may include:

- ❖ accidents due to unfavourable weather conditions: fog, ice, snow, hydroplaning, thunderstorms with strong winds, hail.
- ❖ accidents due to navigation system malfunctions, which are quite common in our country.
- ❖ accidents due to faulty signalling works
- ❖ serious accidents due to technical faults in the means of transport: tyres exploding, brakes failing, breakage of various mechanical components (in the case of bridge traffic).
- ❖ accidents involving explosions or fires caused by ships carrying flammable products or toxic or dangerous substances.
- ❖ accidents caused strictly by drivers: alcohol and more recently even drugs, fatigue, heated arguments with passengers, or even heart attacks, strokes.
- ❖ accidents due to landslides, falling trees, failure of retaining walls and embankment defences, floods or strong earthquakes
- ❖ accidental spills of waterway-specific waste.

6.4.4. Accident prevention measures

6.4.4.1 Preventive measures during the execution phase

These measures must be taken by the general contractor and subcontractors in compliance with the Romanian legislation on occupational health and safety, firefighting, security and civil protection, waste treatment and others. The provisions of the engineering projects, specifications, laws and regulations on quality in construction will also be respected. Briefly, such measures will refer to:

- strict control of the labour force in terms of site discipline: regular training, wearing of protective equipment, checks on alcohol or even drug consumption, presence only at the workplace assigned;

- checking of machinery, means of transport, cranes, equipment, mechanisms and tools before they are brought into service to ascertain that they are intact and in good working order;
- checking, at the prescribed periods, electrical installations, compressed air, oxygen cylinders or other containers with explosive, flammable, toxic and dangerous materials;
- checking at the start of work, in particular at the weekly restart, of the supports and digs of excavations, scaffolding or other supports, in particular bridge supports;
- checking signs prohibiting access to certain areas, danger signs;
- the erection of fencing, signs and other warnings to demarcate work zones to control the access of persons to the site.

6.4.4.2 Measures to prevent accidents during operation

- carrying out the works in strict compliance with the documentation and specifications, ensuring the technical and geometrical elements of the canal
- the erection of guide parapets upstream and downstream of the bridgeheads, connected to them, to prevent them from being hit head-on in the event of skidding or slipping vehicles.
- the provision of all necessary navigational signals, in particular those relating to speed and rights of way, placed in such a way as to enable seafarers to perceive and operate them.

All the above works and actions are necessary and useful to the extent that they are continuously supervised and properly maintained.

These preventive measures avoid or at least substantially minimise the danger of road accidents which, although they do not usually affect the environment, cause significant damage and loss of human life with consequences also in the field of protection of human life and activity.

If measures are taken to improve or extend port facilities in order to increase vessel traffic or capacity, it is necessary to ensure the same level of safety for the passage of ships, while minimising the risk of collisions, fires, explosions or loss of life.

It should be established that ships sailing in the port area should be fitted with special equipment such as radars, positioning and collision avoidance systems.

The use of radars or beacons on shore is recommended. There is a need for an increase in the qualification of pilots and a sustained pace of their training.

6.5 Climate change

Climate change (rising temperatures, changes in precipitation, decreasing snow and ice cover) is occurring globally and in Europe, and some of the observed changes have set records in recent years. Observed climate change has already led to a wide range of impacts on environmental systems and society, with significant impacts expected in the future. Climate change may increase existing vulnerabilities and deepen socio-economic imbalances in Europe.

Measures to mitigate and adapt to the effects of climate change are needed in many areas and can help reduce the damage caused by natural disasters and other impacts of climate change.

Within the project a "***Project Vulnerability Analysis to Climate Change"*** was prepared, based on the requirements of the guidelines developed by the European Commission's Directorate-General for Climate Action (DG CLIMA) - "*Guidelines for Project Managers: Making vulnerable investments climate resilient*", of the guidelines "*Climate change and major projects*" prepared by the European Commission and of the methodology "*Understanding Climate Change Vulnerability and Risk Assessment, Romania Water Projects*", prepared by Jaspers in 2017, the requirements of which are applied for the project *"River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses",* depending on the relevance and available data.

According to the guidelines, the following steps have been taken in the evaluation:

a) **Identify the climate sensitivities of the project** - involved the identification of sensitivity in relation to a range of climate variables and climate related side effects/risks. Project sensitivity in relation to climate variables was assessed in terms of project components, namely: on-site assets and processes, inputs (water, energy, other), outputs ((products, markets, customer demand) and transport links;

b) **Evaluate exposure to climate hazards** - carried out both in terms of current and future climatic conditions in the project implementation area. It is also important to identify and understand the different exposure in terms of frequency and intensity of geographical areas to the effects of climate change;

c) **Assess vulnerability** - identification of climate variables/hazards that may impact the project, based on the sensitivity and exposure of the project to both current and future conditions. This was done using a matrix, where Vulnerability = Sensitivity * Exposure;

d) **Assess risks** - based on vulnerability analysis by identifying risks and opportunities associated with high and medium vulnerabilities. This consisted of assessing the likelihood and magnitude of the consequences of the effects associated with the hazards identified in stage 2, as well as assessing the significance of the risk to the success of the project;

e) **Identify adaptation options** - consisted in identifying those measures that respond to the vulnerabilities and risks identified in the previous stages;

f) **Appraise adaptation options** - was carried out in terms of costs for each of the proposed measures.

The **sensitivity of the project** should be determined in relation to a range of climate variables and secondary effects / climate-related hazards Project sensitivity in relation to climate variables should be realised at the component level, i.e.: assets and processes, inputs (water, energy, etc.), outputs (products, markets, customer demand) and transport links.

In accordance with the guidelines the following sensitivity classes were used:

- ✓ **High sensitivity**: climate variable/hazard may have significant impact on assets and processes, inputs, outputs and transport links;
- ✓ **Medium sensitivity**: climate variable/hazard may have slight impact on assets and processes, inputs, outputs and transport links;
- ✓ **Low sensitivity**: climate variable/hazard may have minimal impact on assets and processes, inputs and outputs or other transport links;
- ✓ **No sensitivity**: climate variable/hazard has no impact on project components.

Exposure analyses should be carried out in terms of current and future climatic conditions. It is also important to identify and understand the intensity and frequency of different exposures to climate change impacts for projects in different geographical locations.

The vulnerability analysis consists in identifying climate variables or climate-related hazards that may have an impact on the project, taking into account sensitivity and exposure, for both current and future conditions. The vulnerability was analysed using the matrix in Table 36, where Vulnerability = Sensitivity x Exposure (tab. 40).

Table no. 40 - Vulnerability classification matrix

		Exposure			
		No	Low	Medium	High
Sensitivity	No				
	Low				
	Medium				
	High				

Legend

Vulnerability	No	Low	Medium	High

The risk analysis is based on vulnerability analysis and focuses on identifying risks and opportunities associated with medium or high vulnerabilities. This process works through assessing the likelihoods and severities of the impacts associated with the hazards identified in Module 2, and assessing the significance of the risk to the success of the project.

The matrix used to analyse the risks is detailed in Table 41.

Table no. 41 - Risk classification matrix (general framework for risk classification)

			Magnitude of consequence				
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
Probability of occurrence	Rare	1	1	2	3	4	5
	Unlikely	2	2	4	6	8	10
	Moderate	3	3	6	9	12	15
	Likely	4	4	8	12	16	20
	Almost certain	5	5	10	15	20	25

Risk level:

			Magnitude of consequence				
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
Probability of occurrence	Rare	1	1	2	3	4	5
	Unlikely	2	2	4	6	8	10
	Moderate	3	3	6	9	12	15
	Likely	4	4	8	12	16	20
	Almost certain	5	5	10	15	20	25

The identification of climate change adaptation options consists of identifying those measures that respond to the climate vulnerabilities and risks that have been identified by applying the previous steps.

6.5.1. Climate change mitigation

The project that is the subject of this analysis is an infrastructure project and may lead to an increase in traffic after the works have been executed.

A Traffic Study is attached to this study (Annex 8). According to this study, carried out for both rivers (Argeș and Dâmbovița, respectively), the determination of the potential for transport demand generation was based on the results of the National Transport Modelling.

In the framework of Romania's General Transport Master Plan, under the conditions defined for the base year 2011, in which the transport system does not benefit from capital investment, the Baseline Scenario forecasts an average annual growth rate for inland waterway and maritime transport of -3.8% in terms of tonnes and -3.3% per year in terms of tonne-km for the period 2011-2020 (Fig. 151).

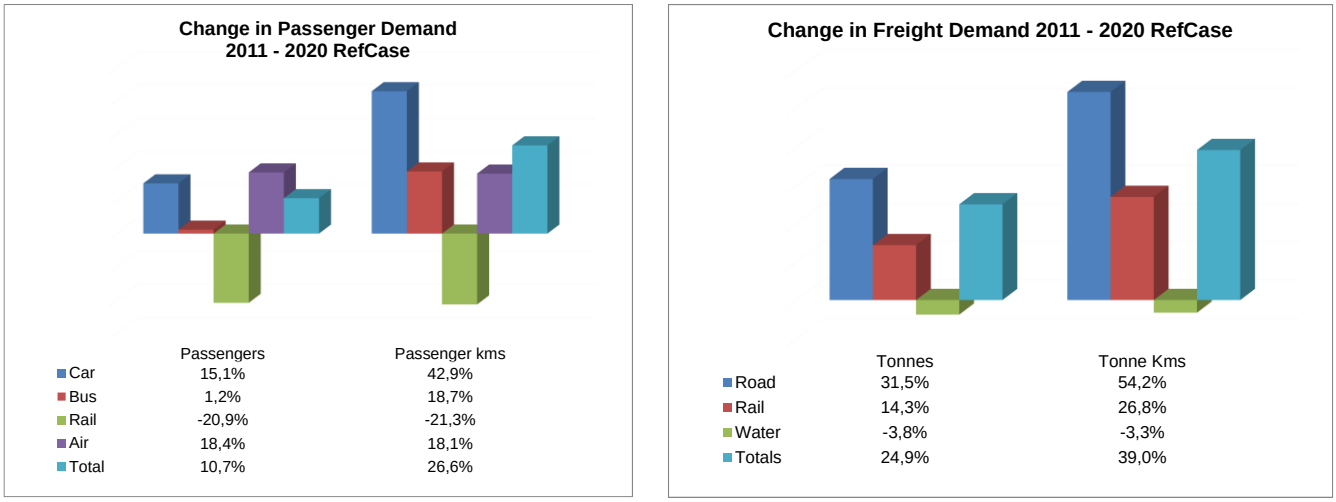


Figure no. 151 - Variation in passenger and freight transport demand between 2011 and the Baseline Scenario 2020[20]

Assuming that the projects foreseen in the GTMP implementation strategy are in operation, the increase in inland waterway freight traffic would be 27.9% (tonnes) and 2.1 (tonne-km) in the year of analysis 2020 (Fig. 152).

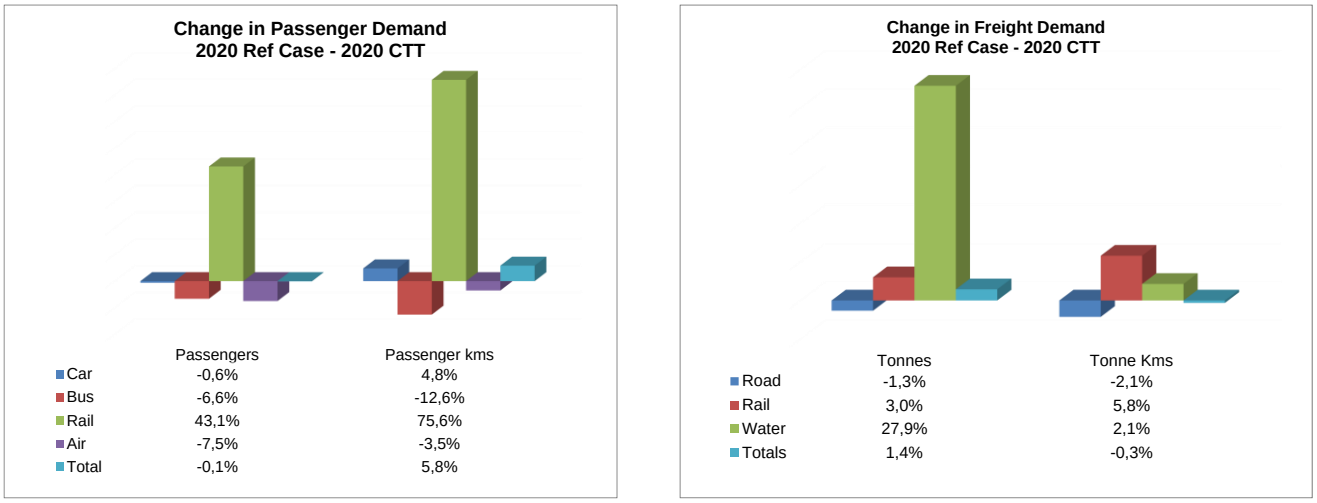


Figure no. 152 - Variation in passenger and freight transport demand between the Baseline Scenario 2020 and the Project Scenario 2020[7]

Based on the information from the traffic study, in the medium forecast scenario, the estimated traffic for the Argeș river in the first year of operation (estimated 2030) is 2.5 million tonnes of freight, which will increase to 10.1 million tonnes in the 10th year of operation, to 15.6 million tonnes in the 20th year and close to the capacity of 20 million tonnes by the end of the forecast period (30th year of operation) (Fig. 153).

[20] *Source: General Transport Master Plan (GTMP)*

Anul de operare		Prognoza traficului (râul Argeș, tone pe an)			Prognoza traficului (râul Argeș, număr barje)		
		Scenariul minimal	Scenariul mediu	Scenariul maximal	Scenariul minimal	Scenariul mediu	Scenariul maximal
2030	1	2.000.000	2.500.000	3.000.000	1.000	1.250	1.500
2031	2	2.794.750	3.500.000	4.194.750	1.397	1.750	2.097
2032	3	3.506.800	4.400.000	5.266.800	1.753	2.200	2.633
2033	4	4.216.150	5.300.000	6.336.150	2.108	2.650	3.168
2034	5	4.843.400	6.100.000	7.283.400	2.422	3.050	3.642
2035	6	5.468.250	6.900.000	8.228.250	2.734	3.450	4.114
2036	7	6.090.700	7.700.000	9.170.700	3.045	3.850	4.585
2037	8	6.710.750	8.500.000	10.110.750	3.355	4.250	5.055
2038	9	7.328.400	9.300.000	11.048.400	3.664	4.650	5.524
2039	10	7.943.650	10.100.000	11.983.650	3.972	5.050	5.992
2040	11	8.438.750	10.750.000	12.738.750	4.219	5.375	6.369
2041	12	8.931.900	11.400.000	13.491.900	4.466	5.700	6.746
2042	13	9.423.100	12.050.000	14.243.100	4.712	6.025	7.122
2043	14	9.912.350	12.700.000	14.992.350	4.956	6.350	7.496
2044	15	10.399.650	13.350.000	15.739.650	5.200	6.675	7.870
2045	16	10.885.000	14.000.000	16.485.000	5.443	7.000	8.243
2046	17	11.368.400	14.650.000	17.228.400	5.684	7.325	8.614
2047	18	11.586.520	14.960.000	17.570.520	5.793	7.480	8.785
2048	19	11.803.710	15.270.000	17.911.710	5.902	7.635	8.956
2049	20	12.019.970	15.580.000	18.251.970	6.010	7.790	9.126
2050	21	12.235.300	15.890.000	18.591.300	6.118	7.945	9.296
2051	22	12.449.700	16.200.000	18.929.700	6.225	8.100	9.465
2052	23	12.663.170	16.510.000	19.267.170	6.332	8.255	9.634
2053	24	12.875.710	16.820.000	19.603.710	6.438	8.410	9.802
2054	25	13.087.320	17.130.000	19.939.320	6.544	8.565	9.970
2055	26	13.298.000	17.440.000	20.274.000	6.649	8.720	10.137
2056	27	13.507.750	17.750.000	20.607.750	6.754	8.875	10.304
2057	28	13.716.570	18.060.000	20.940.570	6.858	9.030	10.470
2058	29	13.924.460	18.370.000	21.272.460	6.962	9.185	10.636
2059	30	14.131.420	18.680.000	21.603.420	7.066	9.340	10.802

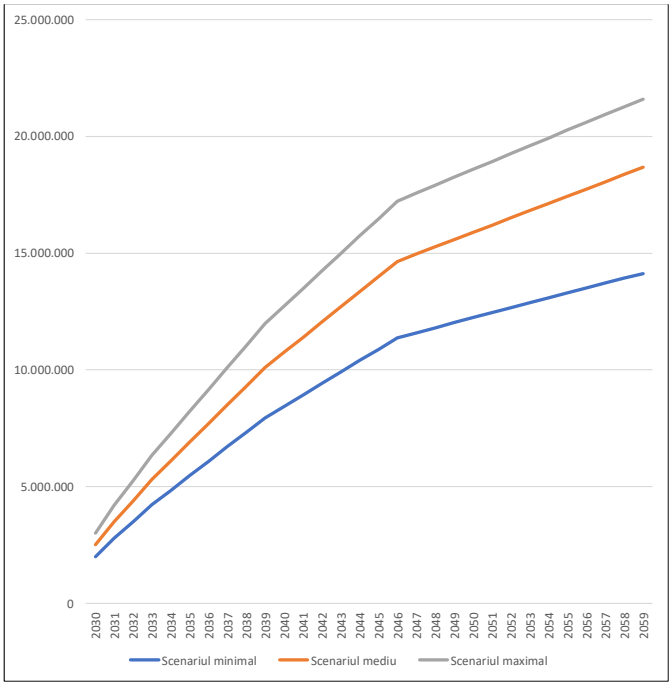


Figure no. 153 - Traffic forecast - Argeș river

In the medium forecast scenario, the estimated traffic for the Dâmbovița river in the first year of operation (estimated 2030) is 0.5 million tonnes of freight, increasing to 2.1 million tonnes in year 10 of operation, 3.1 million tonnes in year 20 and close to the capacity of 4 million tonnes by the end of the forecast period (year 30 of operation) (Fig. 154).

Anul de operare		Prognoza traficului (râul Dâmbovița, tone pe an)			Prognoza traficului (râul Dâmbovița, număr barje)		
		Scenariul minimal	Scenariul mediu	Scenariul maximal	Scenariul minimal	Scenariul mediu	Scenariul maximal
2030	1	425.000	500.000	575.000	213	250	288
2031	2	593.950	700.000	803.950	297	350	402
2032	3	745.360	880.000	1.009.360	373	440	505
2033	4	896.230	1.060.000	1.214.230	448	530	607
2034	5	1.029.680	1.220.000	1.395.680	515	610	698
2035	6	1.162.650	1.380.000	1.576.650	581	690	788
2036	7	1.295.140	1.540.000	1.757.140	648	770	879
2037	8	1.427.150	1.700.000	1.937.150	714	850	969
2038	9	1.558.680	1.860.000	2.116.680	779	930	1.058
2039	10	1.689.730	2.020.000	2.295.730	845	1.010	1.148
2040	11	1.795.250	2.150.000	2.440.250	898	1.075	1.220
2041	12	1.900.380	2.280.000	2.584.380	950	1.140	1.292
2042	13	2.005.120	2.410.000	2.728.120	1.003	1.205	1.364
2043	14	2.109.470	2.540.000	2.871.470	1.055	1.270	1.436
2044	15	2.213.430	2.670.000	3.014.430	1.107	1.335	1.507
2045	16	2.317.000	2.800.000	3.157.000	1.159	1.400	1.579
2046	17	2.420.180	2.930.000	3.299.180	1.210	1.465	1.650
2047	18	2.466.904	2.992.000	3.364.504	1.233	1.496	1.682
2048	19	2.513.442	3.054.000	3.429.642	1.257	1.527	1.715
2049	20	2.559.794	3.116.000	3.494.594	1.280	1.558	1.747
2050	21	2.605.960	3.178.000	3.559.360	1.303	1.589	1.780
2051	22	2.651.940	3.240.000	3.623.940	1.326	1.620	1.812
2052	23	2.697.734	3.302.000	3.688.334	1.349	1.651	1.844
2053	24	2.743.342	3.364.000	3.752.542	1.372	1.682	1.876
2054	25	2.788.764	3.426.000	3.816.564	1.394	1.713	1.908
2055	26	2.834.000	3.488.000	3.880.400	1.417	1.744	1.940
2056	27	2.879.050	3.550.000	3.944.050	1.440	1.775	1.972
2057	28	2.923.914	3.612.000	4.007.514	1.462	1.806	2.004
2058	29	2.968.592	3.674.000	4.070.792	1.484	1.837	2.035
2059	30	3.013.084	3.736.000	4.133.884	1.507	1.868	2.067

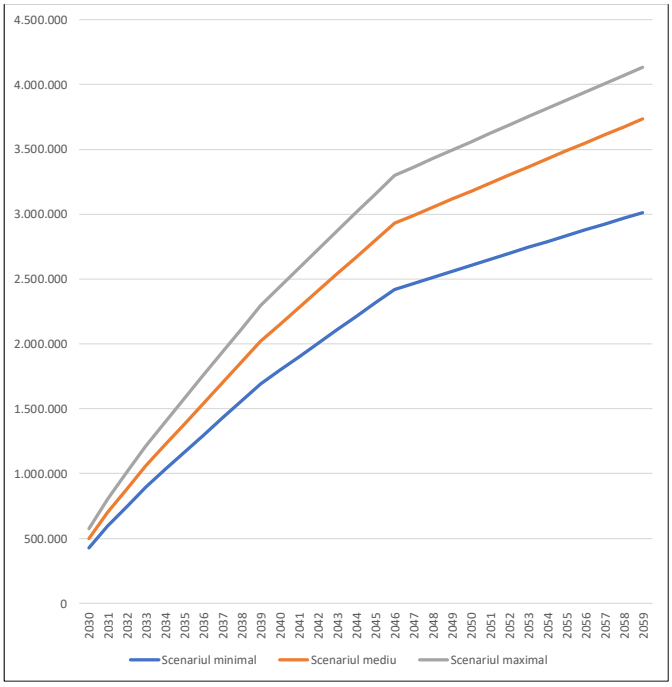


Figure no. 154- Traffic forecast - Dâmbovița river

In the medium forecast scenario, for the Argeș and Dâmbovița rivers the estimated traffic in the first year of operation (estimated 2030) is 3 million tonnes of freight, which will increase to 12.1 million tonnes in year 10 of operation, to 18.7 million tonnes in year 20 and close to the capacity of 24 million tonnes by the end of the forecast period (year 30 of operation) (Fig. 155).

Anul de operare		Prognoza traficului (râurile Argeș și Dâmbovița, tone pe an)			Prognoza traficului (râurile Argeș și Dâmbovița, număr barje)		
		Scenariul minimal	Scenariul mediu	Scenariul maximal	Scenariul minimal	Scenariul mediu	Scenariul maximal
2030	1	2.400.000	3.000.000	3.600.000	1.200	1.500	1.800
2031	2	3.353.700	4.200.000	5.033.700	1.677	2.100	2.517
2032	3	4.208.160	5.280.000	6.320.160	2.104	2.640	3.160
2033	4	5.059.380	6.360.000	7.603.380	2.530	3.180	3.802
2034	5	5.812.080	7.320.000	8.740.080	2.906	3.660	4.370
2035	6	6.561.900	8.280.000	9.873.900	3.281	4.140	4.937
2036	7	7.308.840	9.240.000	11.004.840	3.654	4.620	5.502
2037	8	8.052.900	10.200.000	12.132.900	4.026	5.100	6.066
2038	9	8.794.080	11.160.000	13.258.080	4.397	5.580	6.629
2039	10	9.532.380	12.120.000	14.380.380	4.766	6.060	7.190
2040	11	10.126.500	12.900.000	15.286.500	5.063	6.450	7.643
2041	12	10.718.280	13.680.000	16.190.280	5.359	6.840	8.095
2042	13	11.307.720	14.460.000	17.091.720	5.654	7.230	8.546
2043	14	11.894.820	15.240.000	17.990.820	5.947	7.620	8.995
2044	15	12.479.580	16.020.000	18.887.580	6.240	8.010	9.444
2045	16	13.062.000	16.800.000	19.782.000	6.531	8.400	9.891
2046	17	13.642.080	17.580.000	20.674.080	6.821	8.790	10.337
2047	18	13.903.824	17.952.000	21.084.624	6.952	8.976	10.542
2048	19	14.164.452	18.324.000	21.494.052	7.082	9.162	10.747
2049	20	14.423.964	18.696.000	21.902.364	7.212	9.348	10.951
2050	21	14.682.360	19.068.000	22.309.560	7.341	9.534	11.155
2051	22	14.939.640	19.440.000	22.715.640	7.470	9.720	11.358
2052	23	15.195.804	19.812.000	23.120.604	7.598	9.906	11.560
2053	24	15.450.852	20.184.000	23.524.452	7.725	10.092	11.762
2054	25	15.704.784	20.556.000	23.927.184	7.852	10.278	11.964
2055	26	15.957.600	20.928.000	24.328.800	7.979	10.464	12.164
2056	27	16.209.300	21.300.000	24.729.300	8.105	10.650	12.365
2057	28	16.459.884	21.672.000	25.128.684	8.230	10.836	12.564
2058	29	16.709.352	22.044.000	25.526.952	8.355	11.022	12.763
2059	30	16.957.704	22.416.000	25.924.104	8.479	11.208	12.962

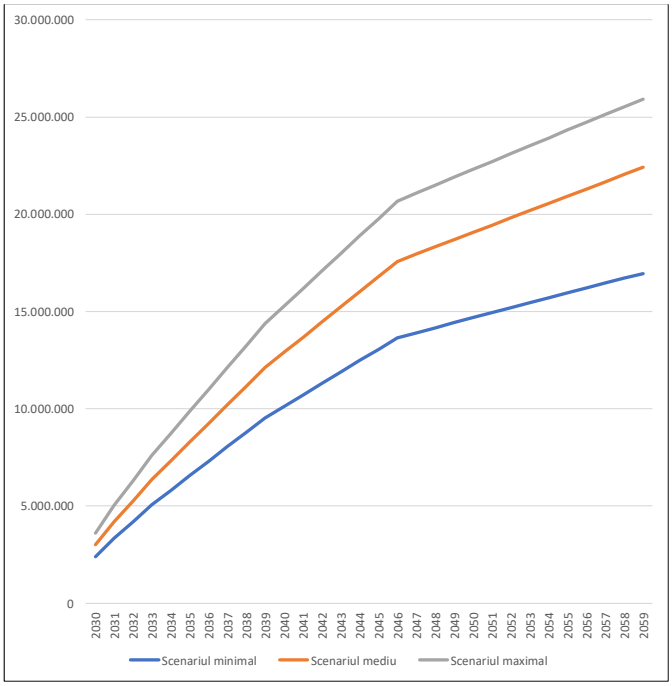


Figure no. 155- Traffic forecast - Argeș and Dâmbovița rivers

The opportunity of completing the complex development works of the lower courses of the Argeș and Dâmbovița rivers results from the examination of the uses obtained by these developments, which are briefly presented below.

By linking Bucharest with the Danube river, and with the European shipping network through a waterway with a transport capacity of more than 20 million tonnes/year, we obtain:

- the connection of the capital to the main trans-European navigation artery, which allows the direct connection of Bucharest with other capitals and major European city centres such as: Belgrade, Budapest, Bratislava, Bratislava, Vienna, Frankfurt, Duisburg, Rotterdam etc.;
- direct access to the seaport of Constanța, and via the Rhine - Main - Danube canal to the European inland waterway network;
- high-capacity transport that is cleaner than rail transport and much less polluting than road transport.

Another internal benefit, this time, is the control and transit of the flood discharges on the lower Argeș river, downstream of the Mihăilești - Cornetu reservoir, up to the Danube, which will lead to:

- the possibility of supplying water to neighbouring localities and ensuring the water needed for irrigation of up to 148,730,000 ha of agricultural land;
- using the energy potential of the river by producing approx. 109.75 GWh/year of renewable electricity in the hydro-power plants of the hydrotechnical nodes part of the river development works;
- the possibility of facilities for fish farming on an area of approx. 1,250 ha;
- developing recreation and tourism in the area;
- favourable ecological influences on the microclimate, given the realisation of a water catchment of almost 3,700 ha in an area reporting a rainfall deficit.

It also ensures an increase in the efficiency and use of the river transport means still existing in Romania, a fleet that mainly transports goods on the Danube and inland waterways (Danube - Black Sea canal, Poarta Albă - Midia - Năvodari canal).

The fleet is utilised, but not at its full capacity, more seasonally, for the transport of grain, aggregates, construction materials, petroleum products, ore.

Making better use of agricultural potential is a major opportunity. The riverside area can become the main supplier of agricultural products, especially vegetables, even flowers for Bucharest. There has already been an increase in cultivated areas and an explosive growth in the areas of high accessible

covers, mainly in the urban areas of the localities along the Argeș river.

The project has flood protection as an important function. With the implementation of the investment objective, in the event of floods with flow rates higher than 5% (approx. 600 m3/s), a number of 11 localities, approx. 9,797 individual households and 20,000 ha of land, 378 km of roads, 5 km of railway and 126 socio-economic objectives.

In the area, desalination works have also been designed in order to maximise the agricultural potential of the land and water can also be supplied to the neighbouring localities.

The works will have favourable ecological influences on the microclimate, given the creation of a water catchment of almost 3,700 ha in an area reporting a rainfall deficit.

The green corridor will be maintained and developed along the banks of the Argeș river, taking into account the boundaries of protected areas and existing archaeological sites.

The excess material resulting from the excavations for the implementation of the investment objective can also be used to fill the abandoned ballast pits on the Argeș river terrace, bringing back into the agricultural circuit large areas of land, radically changing the appearance of the riverside area, for example the area of the port of 1 Decembrie - the bridge at Adunații Copăceni.

The construction market is the most dynamic in the Bucharest area and requires a significant volume of ballast aggregates.

The created waterway integrates the capital of Romania, with a population of about 2,000,000 inhabitants, into the cruise tourism circuits already existing on the Danube, opening important opportunities for local tourism by generating new relations / routes / tourist packages. Through specialised companies and cruise passenger ships, the following activities can be organised on a regular or occasional basis from spring to late autumn:

Recreational routes can also be developed with departures from other areas and embarkation points on the Argeș and Dâmbovița, as well as cruises on the Argeș - Dâmbovița, which will be possible after the regeneration of the Glina area and the greening of the Dâmbovița and the development of the Glina - Budești sector for navigation.

The Bucharest - Danube Canal is a development objective with a long service life, it is a very long-term objective. It follows that, when estimating traffic, strategic objectives must be considered first and foremost.

The traffic generated by the Bucharest - Danube Canal has several major strategic causes:

- opportunity traffic generated by the mere existence of the Bucharest - Danube Canal;
- intermodal traffic, attracted by inter -, multi - and co - modality of inland waterway transport on the Bucharest - Danube Canal in relation to other modes of transport; this traffic is of at least two types, depending on the mode of generation in relation to other modes of transport:
  - *through direct competition;*
  - *through co-operation.*

The strategic requirements for the achievement of the Bucharest - Danube Canal immediately follow:

- *Equipping the Bucharest - Danube Canal with efficient inter-, multi- and co-modal infrastructures and technologies.*
- *Connecting the infrastructure of the Bucharest - Danube Canal to the other transport networks, primarily to the road network.*

- traffic due to value-added services - this is traffic generated by users wishing to use value-added services, mainly logistic services, traffic concentration / consolidation services, industrial zones, free zone areas, etc. For example, several lorries may bring containers and other intermodal units to the intermodal platforms in the Bucharest - Danube Canal area. Here they are consolidated in large batches for onward shipment by water to the centre of Europe. Regional distribution platforms can also be organised.

The Bucharest - Danube Canal is located in the strongest development region in socio-economical terms (Bucharest - Ilfov), is also features the most logistic networks and services. For this reason we

will call it the Bucharest (or Bucharest - Ilfov) logistic pole in this traffic study.

In the medium forecast scenario, for the Argeș and Dâmbovița rivers the estimated traffic in the first year of operation (estimated 2030) is 3 million tonnes of freight, which will increase to 12.1 million tonnes in year 10 of operation, to 18.7 million tonnes in year 20 and close to the capacity of 24 million tonnes by the end of the forecast period (year 30 of operation).

In view of the above-mentioned forecasts for the shipping traffic on the two rivers through the Argeș - Dâmbovița navigation canal, it can be mentioned that, with the implementation of the project, there will be greenhouse gas emissions (mainly in the form of CO_{2e}).

6.5.1.1 GHG emissions - Argeș river

The calculation of the carbon footprint (tonnes of CO_2 emissions) was based on the following input data:

- traffic forecast, in Do-Nothing and Do-Project scenarios, according to the results of the Traffic Study
- unit emissions and fuel consumption according to Jaspers Project Appraisal Guidance (June 2023)
- CO_2 equivalence in tonnes of oil equivalent (i.e. 2.5 tonnes CO_2 = 1 TOE), according to EIB Carbon Footprint Methodologies, 2023.

In terms of the amount of CO_2 emissions, in the perspective year 2033, the amount generated as a result of the implementation of the investment **is reduced from 15,657 tonnes/year (with road traffic and without ship traffic) to 5,353 tonnes/year (with ship traffic only).**

6.5.1.2 GHG emissions - Dâmbovița river

The calculation of the carbon footprint (tonnes of CO_2 emissions) was based on the following input data:

- traffic forecast, in Do-Nothing and Do-Project scenarios, according to the results of the Traffic Study
- unit emissions and fuel consumption according to Jaspers Project Appraisal Guidance (June 2023)
- CO_2 equivalence in tonnes of oil equivalent (i.e. 2.5 tonnes CO_2 = 1 TOE), according to EIB Carbon Footprint Methodologies, 2023.

In terms of the amount of CO_2 emissions, in the perspective year 2033, the amount generated as a result of the implementation of the investment **is reduced from 1,330 tonnes/year (with road traffic and without ship traffic) to 455 tonnes/year (ship traffic only)** (tab. 42).

Table no. 42 - GHG emissions on the Argeș river

Anul de analiză	Anul estimat de operare	Cu Proiect - fluvial			Fără Proiect: rutier		
					Rutier		
		Tone*km	Kg/tona-km	Kg GHG	Tone*km	Kg/tona-km	Kg GHG
2024		0	0,016	0	0	0,040	0
2025		0	0,015	0	0	0,040	0
2026		0	0,015	0	0	0,040	0
2027		0	0,015	0	0	0,040	0
2028		0	0,015	0	0	0,040	0
2029	1	136.875.000	0,015	1.995.544	136.875.000	0,040	5.538.875
2030	2	182.500.000	0,014	2.626.136	182.500.000	0,040	7.385.167
2031	3	255.500.000	0,014	3.628.795	255.500.000	0,040	10.339.233
2032	4	321.200.000	0,014	4.502.609	321.200.000	0,040	12.997.893
2033	5	386.900.000	0,014	5.353.091	386.900.000	0,040	15.656.553
2034	6	445.300.000	0,014	6.081.010	445.300.000	0,040	18.019.807
2035	7	503.700.000	0,013	6.789.099	503.700.000	0,040	20.383.060
2036	8	562.100.000	0,013	7.477.750	562.100.000	0,040	22.746.313
2037	9	620.500.000	0,013	8.147.348	620.500.000	0,040	25.109.567
2038	10	678.900.000	0,013	8.798.273	678.900.000	0,040	27.472.820
2039	11	737.300.000	0,013	9.430.897	737.300.000	0,040	29.836.073
2040	12	784.750.000	0,013	9.907.344	784.750.000	0,040	31.756.217
2041	13	832.200.000	0,012	10.369.810	832.200.000	0,040	33.676.360
2042	14	879.650.000	0,012	10.818.577	879.650.000	0,040	35.596.503
2043	15	927.100.000	0,012	11.253.924	927.100.000	0,040	37.516.647
2044	16	974.550.000	0,012	11.676.123	974.550.000	0,040	39.436.790
2045	17	1.022.000.000	0,012	12.085.444	1.022.000.000	0,040	41.356.933
2046	18	1.069.450.000	0,012	12.482.148	1.069.450.000	0,040	43.277.077
2047	19	1.092.080.000	0,012	12.580.574	1.092.080.000	0,040	44.192.837
2048	20	1.114.710.000	0,011	12.674.331	1.114.710.000	0,040	45.108.598
2049	21	1.137.340.000	0,011	12.763.525	1.137.340.000	0,040	46.024.359
2050	22	1.159.970.000	0,011	12.848.257	1.159.970.000	0,040	46.940.119
2051	23	1.182.600.000	0,011	12.928.630	1.182.600.000	0,040	47.855.880
2052	24	1.205.230.000	0,011	13.004.741	1.205.230.000	0,040	48.771.641

According to the results, in the perspective year 2033 (5 years of operation), the total amount of TOE will be reduced from **6,263 toe/year to 2,141 toe/year**, as a result of the traffic shift from road to ship mode after the project implementation.

An	Operare	Tone GHG Fara Proiect	Tone GHG Cu Proiect	Tone GHG incremental	Cost unitar CO2 (euro/ tona)	Beneficii din reducerea CO2
2024		0	0	0	187,4	0
2025		0	0	0	208,9	0
2026		0	0	0	230,5	0
2027		0	0	0	252,0	0
2028		0	0	0	273,5	0
2029	1	5.539	1.996	3.543	295,1	1.045.484
2030	2	7.385	2.626	4.759	316,6	1.506.636
2031	3	10.339	3.629	6.710	352,0	2.362.356
2032	4	12.998	4.503	8.495	387,5	3.291.919
2033	5	15.657	5.353	10.303	423,0	4.357.922
2034	6	18.020	6.081	11.939	458,4	5.472.917
2035	7	20.383	6.789	13.594	493,9	6.713.676
2036	8	22.746	7.478	15.269	528,1	8.062.765
2037	9	25.110	8.147	16.962	562,3	9.537.079
2038	10	27.473	8.798	18.675	596,4	11.138.346
2039	11	29.836	9.431	20.405	630,6	12.868.248
2040	12	31.756	9.907	21.849	664,8	14.525.733
2041	13	33.676	10.370	23.307	699,0	16.291.715
2042	14	35.597	10.819	24.778	733,2	18.167.420
2043	15	37.517	11.254	26.263	767,4	20.154.040
2044	16	39.437	11.676	27.761	801,6	22.252.732
2045	17	41.357	12.085	29.271	835,8	24.464.622
2046	18	43.277	12.482	30.795	871,2	26.829.797
2047	19	44.193	12.581	31.612	906,7	28.662.783
2048	20	45.109	12.674	32.434	942,2	30.558.129
2049	21	46.024	12.764	33.261	977,6	32.516.229
2050	22	46.940	12.848	34.092	1.013,1	34.537.465
2051	23	47.856	12.929	34.927	1.035,4	36.162.215
2052	24	48.772	13.005	35.767	1.035,4	37.031.553

An	Operare	TEP Fara Proiect	TEP Cu Proiect	Incremental
2024		0	0	0
2025		0	0	0
2026		0	0	0
2027		0	0	0
2028		0	0	0
2029	1	2.216	798	-1.417
2030	2	2.954	1.050	-1.904
2031	3	4.136	1.452	-2.684
2032	4	5.199	1.801	-3.398
2033	5	6.263	2.141	-4.121
2034	6	7.208	2.432	-4.776
2035	7	8.153	2.716	-5.438
2036	8	9.099	2.991	-6.107
2037	9	10.044	3.259	-6.785
2038	10	10.989	3.519	-7.470
2039	11	11.934	3.772	-8.162
2040	12	12.702	3.963	-8.740
2041	13	13.471	4.148	-9.323
2042	14	14.239	4.327	-9.911
2043	15	15.007	4.502	-10.505
2044	16	15.775	4.670	-11.104
2045	17	16.543	4.834	-11.709
2046	18	17.311	4.993	-12.318
2047	19	17.677	5.032	-12.645
2048	20	18.043	5.070	-12.974
2049	21	18.410	5.105	-13.304
2050	22	18.776	5.139	-13.637
2051	23	19.142	5.171	-13.971
2052	24	19.509	5.202	-14.307

Table no. 43 - GHG emissions on the Dâmbovița river

Anul de analiză	Anul estimat de operare	Cu Proiect - fluvial			Fără Proiect: rutier		
					Rutier		
		Tone*km	Kg/tona-km	Kg GHG	Tone*km	Kg/tona-km	Kg GHG
2024		0	0,016	0	0	0,040	0
2025		0	0,015	0	0	0,040	0
2026		0	0,015	0	0	0,040	0
2027		0	0,015	0	0	0,040	0
2028		0	0,015	0	0	0,040	0
2029	1	11.625.000	0,015	169.485	11.625.000	0,040	470.425
2030	2	15.500.000	0,014	223.042	15.500.000	0,040	627.233
2031	3	21.700.000	0,014	308.199	21.700.000	0,040	878.127
2032	4	27.280.000	0,014	382.413	27.280.000	0,040	1.103.931
2033	5	32.860.000	0,014	454.646	32.860.000	0,040	1.329.735
2034	6	37.820.000	0,014	516.469	37.820.000	0,040	1.530.449
2035	7	42.780.000	0,013	576.608	42.780.000	0,040	1.731.164
2036	8	47.740.000	0,013	635.097	47.740.000	0,040	1.931.879
2037	9	52.700.000	0,013	691.967	52.700.000	0,040	2.132.593
2038	10	57.660.000	0,013	747.251	57.660.000	0,040	2.333.308
2039	11	62.620.000	0,013	800.980	62.620.000	0,040	2.534.023
2040	12	66.650.000	0,013	841.446	66.650.000	0,040	2.697.103
2041	13	70.680.000	0,012	880.724	70.680.000	0,040	2.860.184
2042	14	74.710.000	0,012	918.838	74.710.000	0,040	3.023.265
2043	15	78.740.000	0,012	955.813	78.740.000	0,040	3.186.345
2044	16	82.770.000	0,012	991.671	82.770.000	0,040	3.349.426
2045	17	86.800.000	0,012	1.026.435	86.800.000	0,040	3.512.507
2046	18	90.830.000	0,012	1.060.128	90.830.000	0,040	3.675.587
2047	19	92.752.000	0,012	1.068.487	92.752.000	0,040	3.753.364
2048	20	94.674.000	0,011	1.076.450	94.674.000	0,040	3.831.141
2049	21	96.596.000	0,011	1.084.025	96.596.000	0,040	3.908.918
2050	22	98.518.000	0,011	1.091.222	98.518.000	0,040	3.986.695
2051	23	100.440.000	0,011	1.098.048	100.440.000	0,040	4.064.472
2052	24	102.362.000	0,011	1.104.512	102.362.000	0,040	4.142.249

According to the results, in the perspective year 2033 (5 years of operation), the total amount of TOE will be reduced **from 532 toe/year to 182 toe/year**, as a result of the traffic shift from road to ship mode after the project implementation (tab. 43).

An	Operare	Tone GHG Fara Proiect	Tone GHG Cu Proiect	Tone GHG incremental	Cost unitar CO2 (euro/ tona)	Beneficii din reducerea CO2
2024		0	0	0	187,4	0
2025		0	0	0	208,9	0
2026		0	0	0	230,5	0
2027		0	0	0	252,0	0
2028		0	0	0	273,5	0
2029	1	470	169	301	295,1	88.795
2030	2	627	223	404	316,6	127.961
2031	3	878	308	570	352,0	200.638
2032	4	1.104	382	722	387,5	279.588
2033	5	1.330	455	875	423,0	370.125
2034	6	1.530	516	1.014	458,4	464.823
2035	7	1.731	577	1.155	493,9	570.203
2036	8	1.932	635	1.297	528,1	684.783
2037	9	2.133	692	1.441	562,3	809.998
2038	10	2.333	747	1.586	596,4	945.997
2039	11	2.534	801	1.733	630,6	1.092.920
2040	12	2.697	841	1.856	664,8	1.233.692
2041	13	2.860	881	1.979	699,0	1.383.680
2042	14	3.023	919	2.104	733,2	1.542.986
2043	15	3.186	956	2.231	767,4	1.711.713
2044	16	3.349	992	2.358	801,6	1.889.958
2045	17	3.513	1.026	2.486	835,8	2.077.817
2046	18	3.676	1.060	2.615	871,2	2.278.695
2047	19	3.753	1.068	2.685	906,7	2.434.373
2048	20	3.831	1.076	2.755	942,2	2.595.348
2049	21	3.909	1.084	2.825	977,6	2.761.652
2050	22	3.987	1.091	2.895	1.013,1	2.933.319
2051	23	4.064	1.098	2.966	1.035,4	3.071.311
2052	24	4.142	1.105	3.038	1.035,4	3.145.146

An	Operare	TEP Fara Proiect	TEP Cu Proiect	Incremental
2024		0	0	0
2025		0	0	0
2026		0	0	0
2027		0	0	0
2028		0	0	0
2029	1	188	68	-120
2030	2	251	89	-162
2031	3	351	123	-228
2032	4	442	153	-289
2033	5	532	182	-350
2034	6	612	207	-406
2035	7	692	231	-462
2036	8	773	254	-519
2037	9	853	277	-576
2038	10	933	299	-634
2039	11	1.014	320	-693
2040	12	1.079	337	-742
2041	13	1.144	352	-792
2042	14	1.209	368	-842
2043	15	1.275	382	-892
2044	16	1.340	397	-943
2045	17	1.405	411	-994
2046	18	1.470	424	-1.046
2047	19	1.501	427	-1.074
2048	20	1.532	431	-1.102
2049	21	1.564	434	-1.130
2050	22	1.595	436	-1.158
2051	23	1.626	439	-1.187
2052	24	1.657	442	-1.215

6.5.2. Adaptation to climate change

Extreme weather events are increasingly linked to climate change. Thus, it is necessary to identify the impacts of climate change on natural and anthropogenic systems, the vulnerability of these systems as well as adaptation to the effects of climate change.

Vulnerability involves analysing the adverse impacts of climate change, including climate variability and extreme weather events, on natural and anthropogenic systems and depends on the type, amplitude and rate of climate variability to which they are exposed and their ability to adapt.

Vulnerability - the negative impacts of climate change, including climate variability and extreme weather events, on natural and anthropogenic systems.

Vulnerability depends on the type, magnitude and rate of climate variability to which a system is exposed and its capacity to adapt.

Adaptation is the ability of natural and anthropogenic systems to respond to the effects of climate change, including climate variability and extreme weather events, in order to minimise potential damage, take advantage of opportunities or cope with the consequences of climate change.

Adaptation to climate impacts is a complex process, as the severity of impacts varies from region to region, depending on exposure, physical vulnerability, degree of socio-economic development, natural and human adaptive capacity, health services and disaster monitoring mechanisms.

The main factors that may contribute to climate change will be analysed below (according to the *Commission Notice - Technical guidance on the climate proofing of infrastructure in the period 2021-2027, No 2021/C 373/01), Annex D.6.*

6.5.2.1 Heat waves

The proposed project will involve new construction (as described in the previous chapters), rehabilitation of existing buildings, but the height level will not be higher than the existing one in the area, so that air circulation will not create a negative impact on the environment and/or on the population in the area. The area in which the project is being developed is predominantly agricultural, with residential areas more than 1 km away.

We also note that through the implementation of the project there will be no additional sources of emissions of volatile organic compounds or other compounds contributing to the formation of tropospheric ozone. Also, the proposed works, during the operation of the navigable canal, the hydrotechnical constructions and implicitly the ports, will not generate additional sources of heat or absorb heat, the works will contribute to the development of the courses of the two rivers, dredging in order to clean the navigable canal on the water courses, ensuring the necessary depth for the execution of the works.

The works will be carried out with high-performance materials/equipment, with low energy consumption, so that, during the period of operation, the increase in energy consumption is not expected to be very high. No alternative renewable electricity supply systems have been analysed (for the time being) so far.

The proposed works and the activity will not require the use of cooling water (no equipment will be used that requires cooling water that would lead to an increase in the temperature level in the water bodies of the Argeș and Dâmbovița rivers with negative effects in the short, medium and long term).

The activity carried out will be the transit of ship transport, cargo, loading/unloading cargo from/to ships berthed in the port - a specific activity of cargo and passenger ports.

For the execution of the works as described in the previous chapters, the materials used will be specific to these types of works (mineral aggregates) resistant to higher temperatures that do not present the risk of cracking or ageing with the passage of time.

According to literature data *(National Hydrological Administration report on "Climate change - from physical basis to risks and adaptation")*, persistent heat waves have become extremely frequent in the

last decade compared to previous periods.

Thus, an increase in the number of warming days will be recorded over the 2021-2050 horizon compared to the 1971-2000 period. The increase in the number of days with heat wave impacts will be more pronounced in the extra-Carpathian regions, in the south, south-east and west of Romania, including the project area.

The trend in the number of days with a minimum temperature above the 20°C limit (tropical nights) shows an increase in Romania. In the project area of interference, up to 18 more tropical nights per year were expected to occur between 2021 and 2050 than in the baseline period - in this case 1971-2000. This type of change causes consequences that cannot be neglected in terms of the health of the population and the infrastructure impacted by this heat stress.

Therefore, analysing all the available data, it results that the project area will be subject to gradual increases in temperature, with the increase in average temperature being the result of the increase in minimum temperatures and the increase in the number of days with high temperatures. Therefore, in the project area, there is no question of decreases in minimum temperatures, nor of spectacular increases in maximum temperatures.

An analysis of temperatures and their variations has been analysed in detail in *chapter 4.3 Climate change* and in Annex 10 of this study.

6.5.2.2 Drought

One risk that could occur as a result of rising air temperatures in the future is drought.

In Romania, trend analysis of seasonal rainfall variability shows significant increases in autumn, which is directly reflected in the increasing trends of the seasonal discharge.

In terms of rainfall, during the period 1901-2000 there was a general downward trend in annual precipitation, while after 1960 there was an intensification of the precipitation deficit in the south of the country.

The project area is characterised by low and often heavy rainfall in summer and frequent droughts.

According to the data provided by the National Meteorological Administration, the project area is rather characterised by a decreasing trend in average precipitation, but also by the alternation of periods of extreme precipitation with periods of drought.

In line with the National Hydrology Administration's report on *"Climate Change - from physical basis to risks and adaptation*", the annual precipitation in the project area will continue to decrease over the next 50 years.

However, this trend is occurring in parallel with an increasing trend in the number of extreme precipitation events and the amount of precipitation recorded during these events.

According to the report prepared by the General Inspectorate for Emergency Situations - Country Report - 2016 - Conditionality 5.1, the project site is located in an area with a high risk of drought, as shown in the above (chapter 4.3) regarding the evolution of annual rainfall (fig. 156).

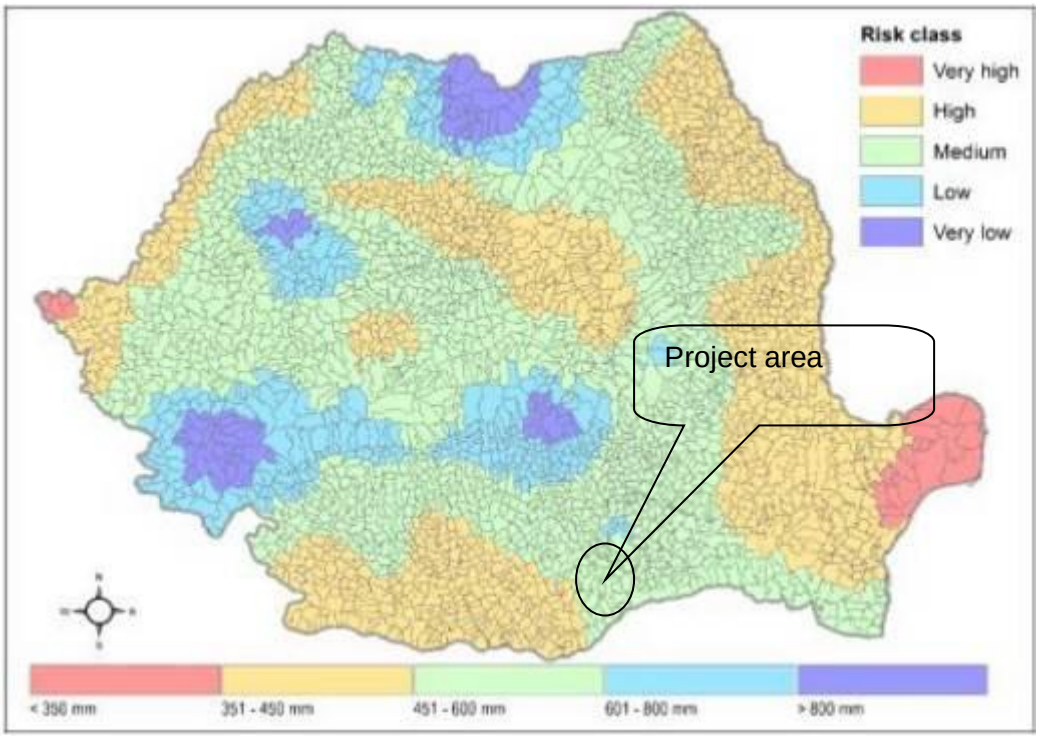


Figure no. 156 - Drought risk map

The proposed project aims to develop the Argeș and Dâmbovița rivers for navigation and other uses, as described in the previous chapters. The proposed developments will also include water supply networks in port areas. For this work, a water rights permit will be obtained, containing details of the water supply, but it is expected that by implementing the project water consumption will not be significant so as to affect the volumes of water from the groundwater bodies in the area

As stated above, the project area presents a medium risk of drought, as shown in the above figure, with respect to the evolution of annual precipitation amounts.

For situations of drought and/or situations where water discharges will increase presenting a risk of flooding, the Beneficiary will have in place a *Plan for the safe operation of the hydrotechnical constructions.*

6.5.2.3 Wildfires, forest fires

The project site is located on the banks of the Argeș and Dâmbovița rivers. As presented in the previous chapters and in the attached photos, the area is predominantly agricultural. In places there are buildings started in earlier phases of the project and where vegetation exists the area will be cleared. The project also includes areas which will be deforested. With this in mind, the area will be concreted, so there will be no risk of vegetation fires.

This risk is very low and will not generate a potential climate change impact in the project area.

6.5.2.4 Flood regimes and extreme rainfall events

In general, floods occur as a result of hurricanes, weather systems passing through a region and/or snow melt. Very dangerous are flash floods, caused by intense rainfall in a short time over a small area. They are also the hardest to forecast.

According to the Flood Hazard Areas Map of the Romanian water management authority (ANAR), the area is a flood prone area with 0.1%, 1% and even 10% probability of flooding, as shown in Figures 157-159.

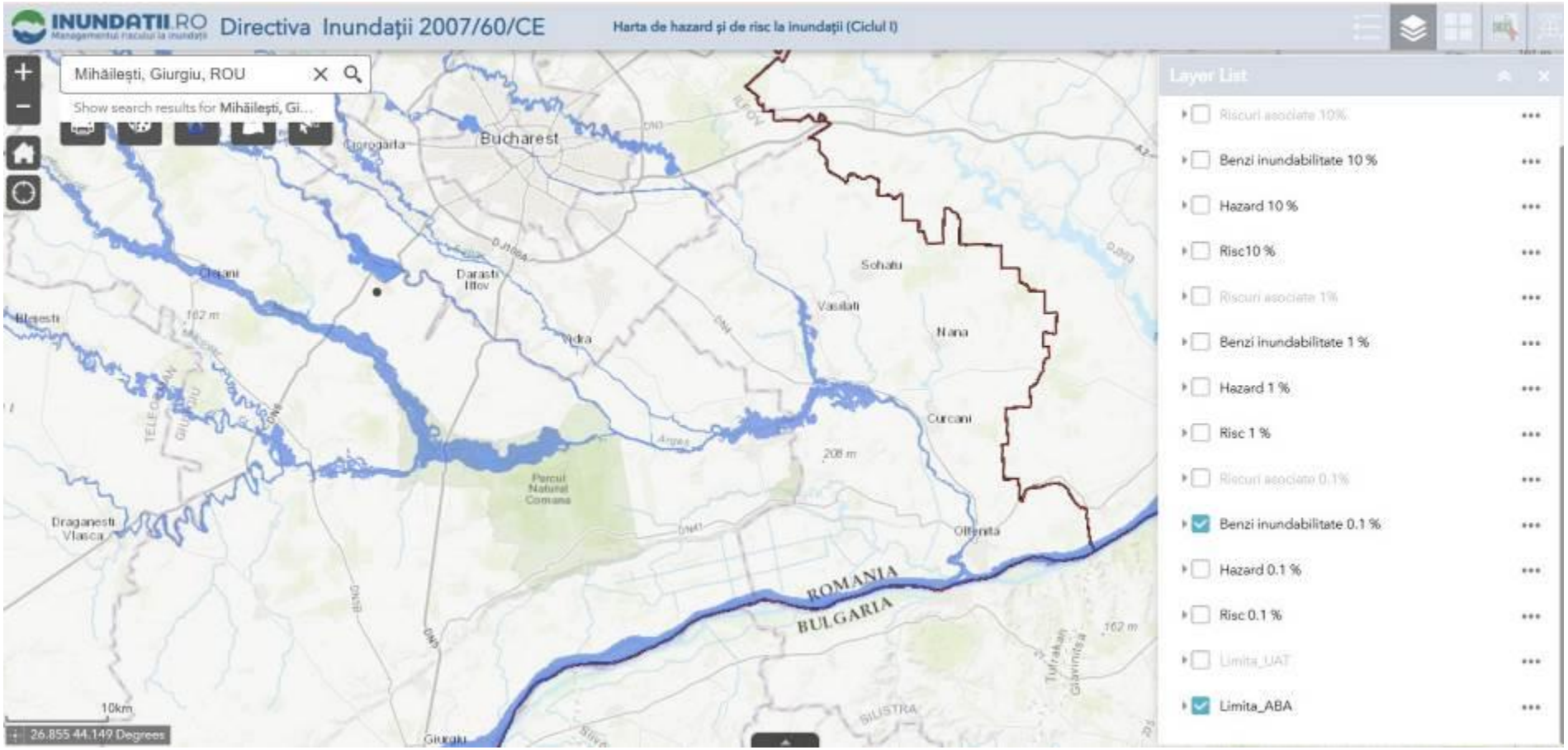


Figure 157 - 0.1% flood risk area

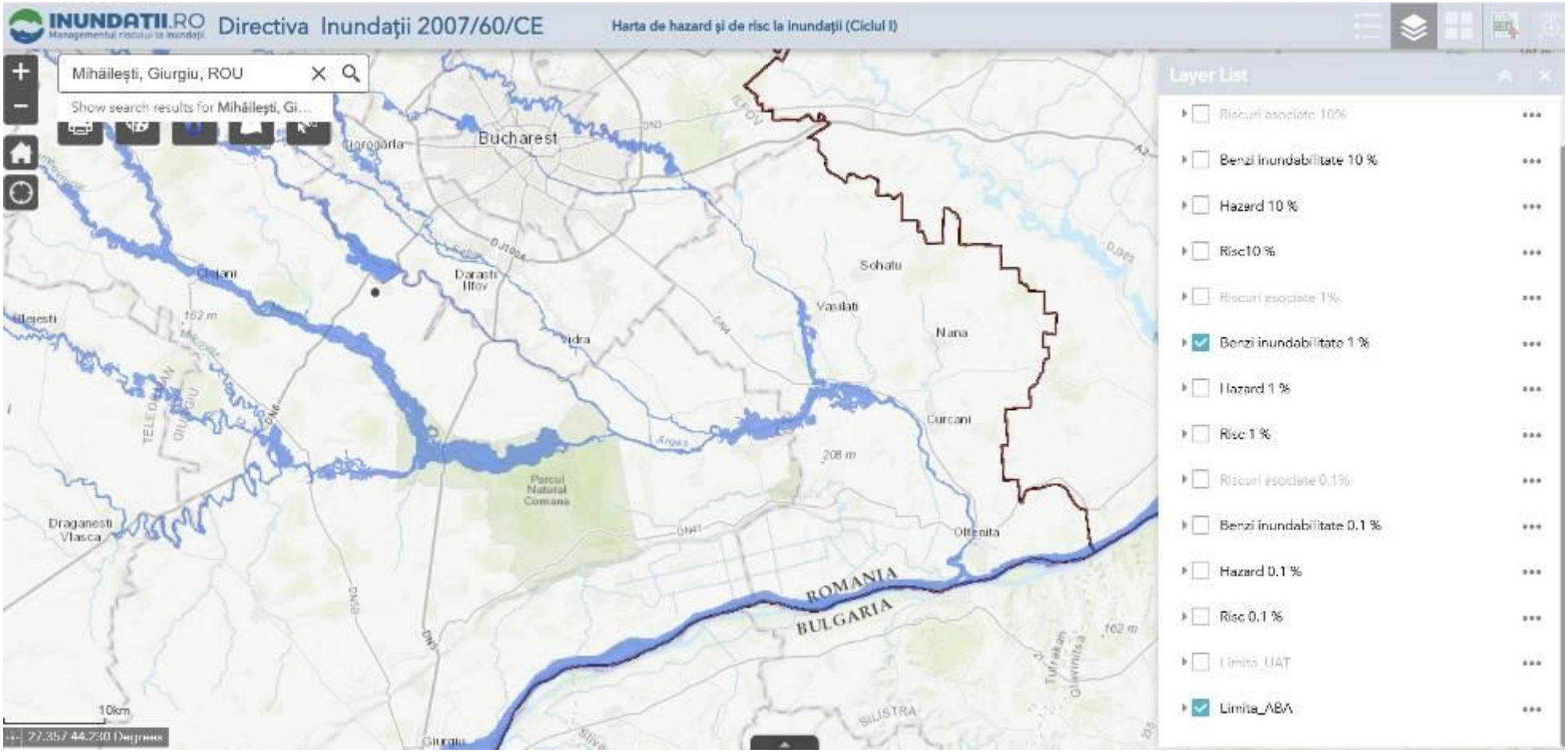


Figure no. 158 - 1% flood risk zone

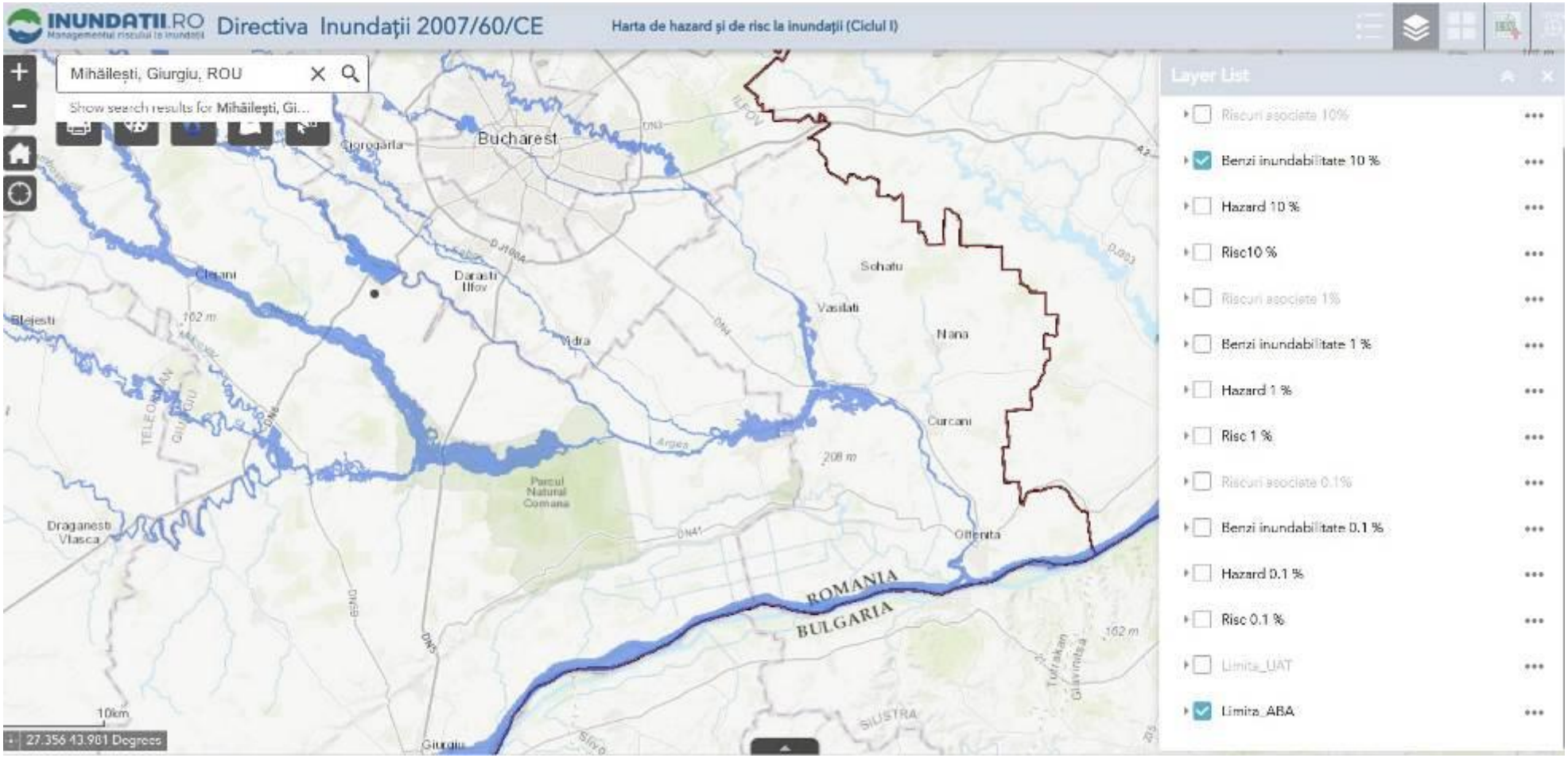


Figure 159 - 10% flood risk area

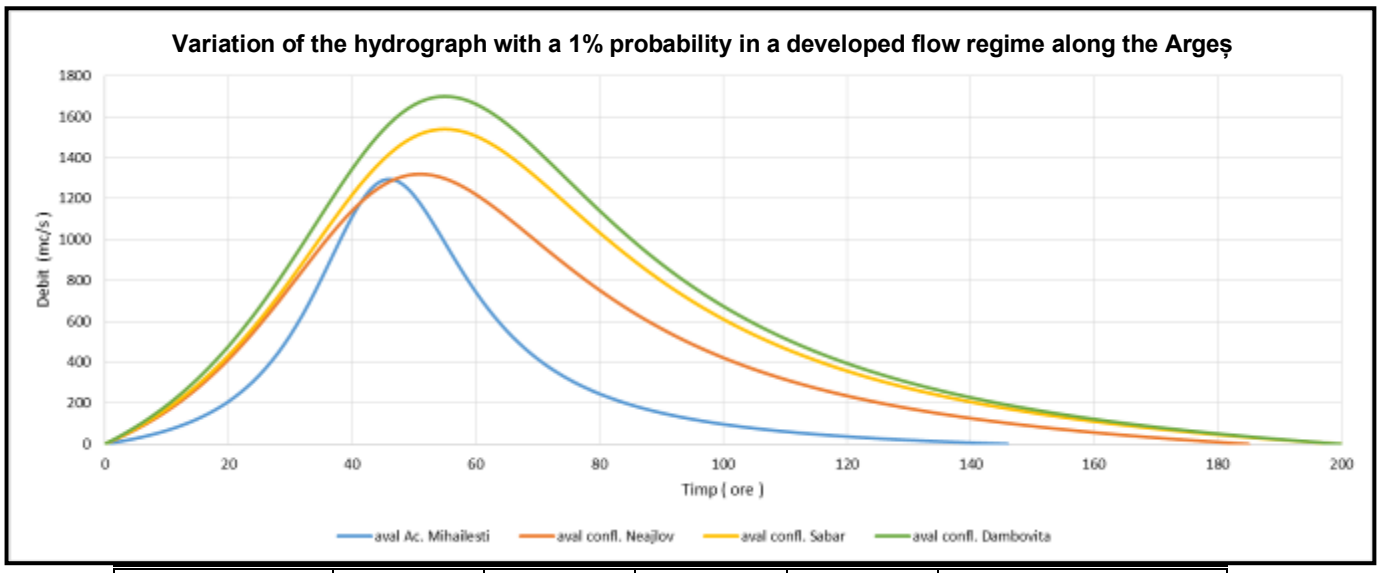
For the present project, a hydrological study on the Argeș River was commissioned to the National Institute of Hydrology and Water Management of Bucharest - Study Cf 743/2023.

The obtained data consist of the values of the maximum flow rates with different probabilities of exceedance in a developed flow regime on the Argeș river according to the following table:

Raul¤	Secțiunea¤	Qmax·(mc/s)¤						Tt¤	Tcr.¤	γ¤
¤	¤	0,1%¤	0.5%¤	1%¤	2%¤	5%¤	10%¤	(ore)¤	(ore)¤	¤
Argeș¤	Av·Acumulare·Mihăilești¤	2250¤	1600¤	1295¤	1000¤	570¤	400¤	146¤	46¤	0,26¤
Argeș¤	av.·Confl.·Râul·Neajlov¤	2255¤	1610¤	1320¤	1025¤	590¤	425¤	185¤	51¤	0,36¤
Argeș¤	av.·Confl.·Râul·Sabar¤	2580¤	1880¤	1540¤	1230¤	750¤	565¤	200¤	55¤	0,36¤
Argeș¤	av.·Confl.·Râul·Dambovita¤	2760¤	2055¤	1700¤	1400¤	900¤	695¤	200¤	55¤	0,36¤

Taking into account the fact that the navigable canal is of class II of importance (STAS 4273 - 83), the designed and verification discharges are as follows:

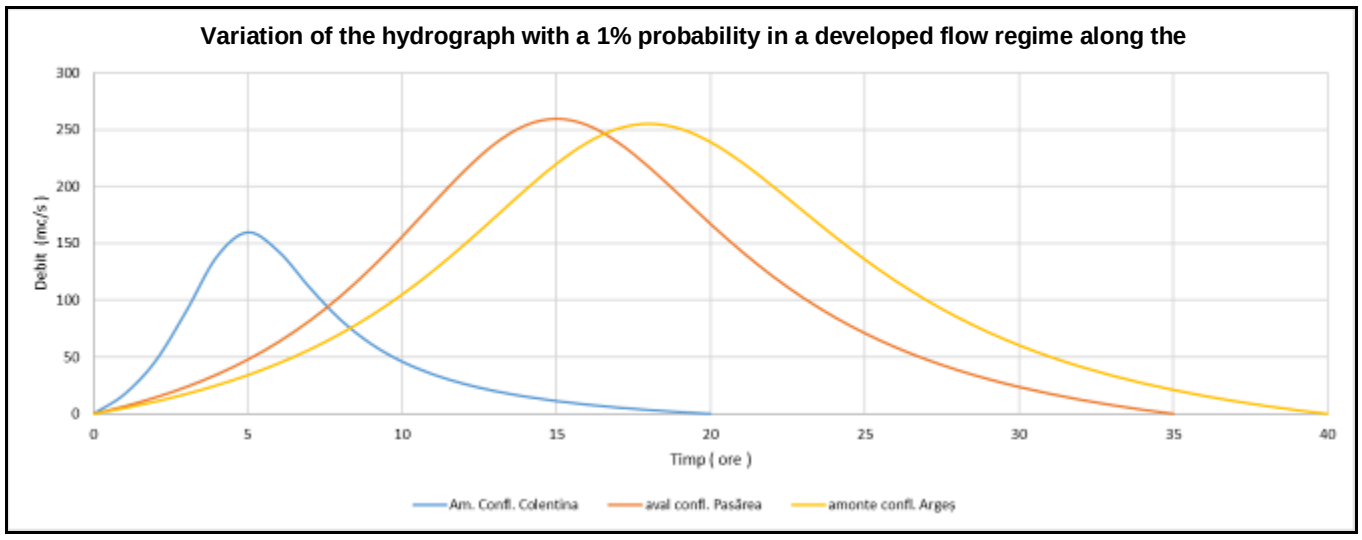
Hydrotechnical node	HN1	HN2	HN3	HN4	Observations
Q1% (m^3/s)	1700	1540	1295	1295	Designed discharges

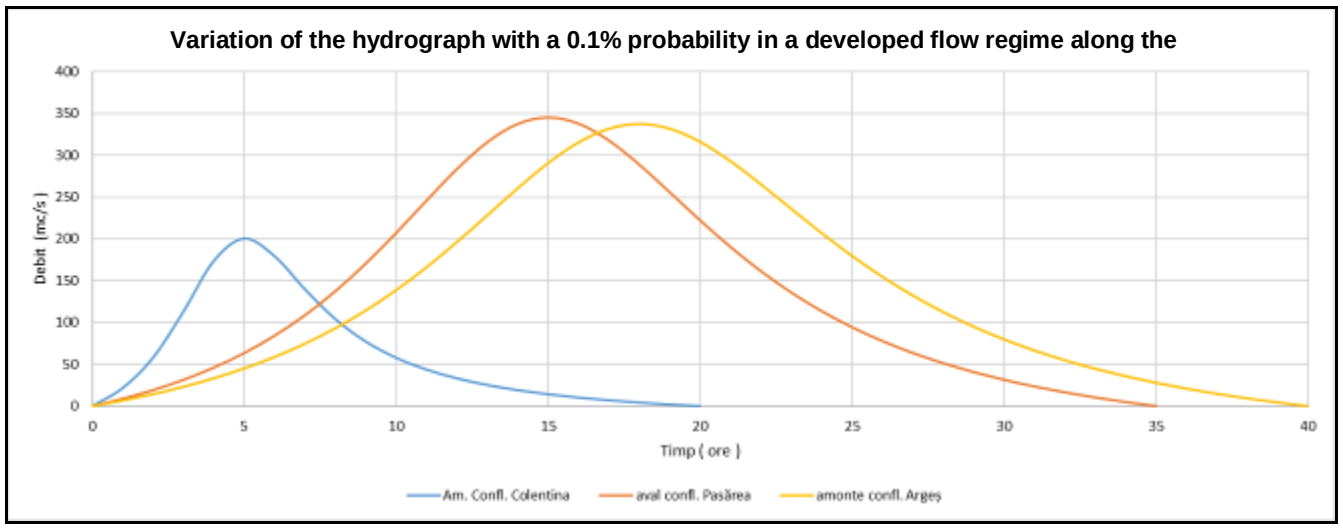


Q0.1% (m^3/s)	2760	2580	2250	2250	Verification discharges

According to the hydrological study of the Dâmbovița river prepared by the National Institute of Hydrology and Water Management of Bucharest - Study Cf 743/2023, the values of the maximum discharges with different probabilities of exceedance in a developed flow regime on the Dâmbovița river are presented in the following table:

Raul¤	Secțiunea¤	Qmax·(mc/s)¤					Tt¤	Tcr.¤	γ¤
¤	¤	0,1%¤	0.5%¤	1%¤	2%¤	¶ 5%¶ ¤	(ore)¤	(ore)¤	¤
Dâmbovița¤	amonte·Confl.· Râul· Colentina¤	200¤	175¤	160¤	147¤	130¤	20¤	5¤	0,32¤
Dâmbovița¤	Aval·Confl.· Râul· Colentina,· aval·confl.·R.· Pasărea¤	345¤	285¤	260¤	230¤	195¤	35¤	15¤	0,40¤
Dâmbovița¤	amonte·Confl.· Râul·Câlnău,· amonte·confl.· Râul·Argeș¤	338¤	280¤	255¤	225¤	191¤	40¤	18¤	0,40¤





Taking into account the fact that Tânganu and Cucuieți hydrotechnical nodes are classified in class II of importance (STAS 4273 - 83), the designed and verification discharges are as follows:

Q design p= 1% = 260 m^3/s;

Q verification p= 0.1% = 345 m^3/s

For the simulation of water flow in order to propagate flood waves with exceedance probabilities of 1% and 0.1%, *under the developed hydrological regime*, on the Argeș river sector under the conditions of the Navigable Canal development, in the area of interest of the project, namely downstream Mihăilești dam - upstream the confluence with the Danube river, a 1D hydraulic model was developed by introducing on the same alignments the characteristic sections designed both along the canal and in the sections of the HN1-HN4 hydrotechnical nodes, as specified in the project (typical cross sections, longitudinal profile, designed route) on the whole river sector, on a non-permanent basis (Fig.160).

The roughness coefficients adopted in accordance with the recommendations of the "HEC - RAS - River Analysis System - Hydraulic Reference Manual", taking into account the characteristics of the designed sections, had the following values:

Variable between 0.025 - 0.03 in the minor riverbed and between 0.05 -0.06 in the major riverbed of the Argeș river.

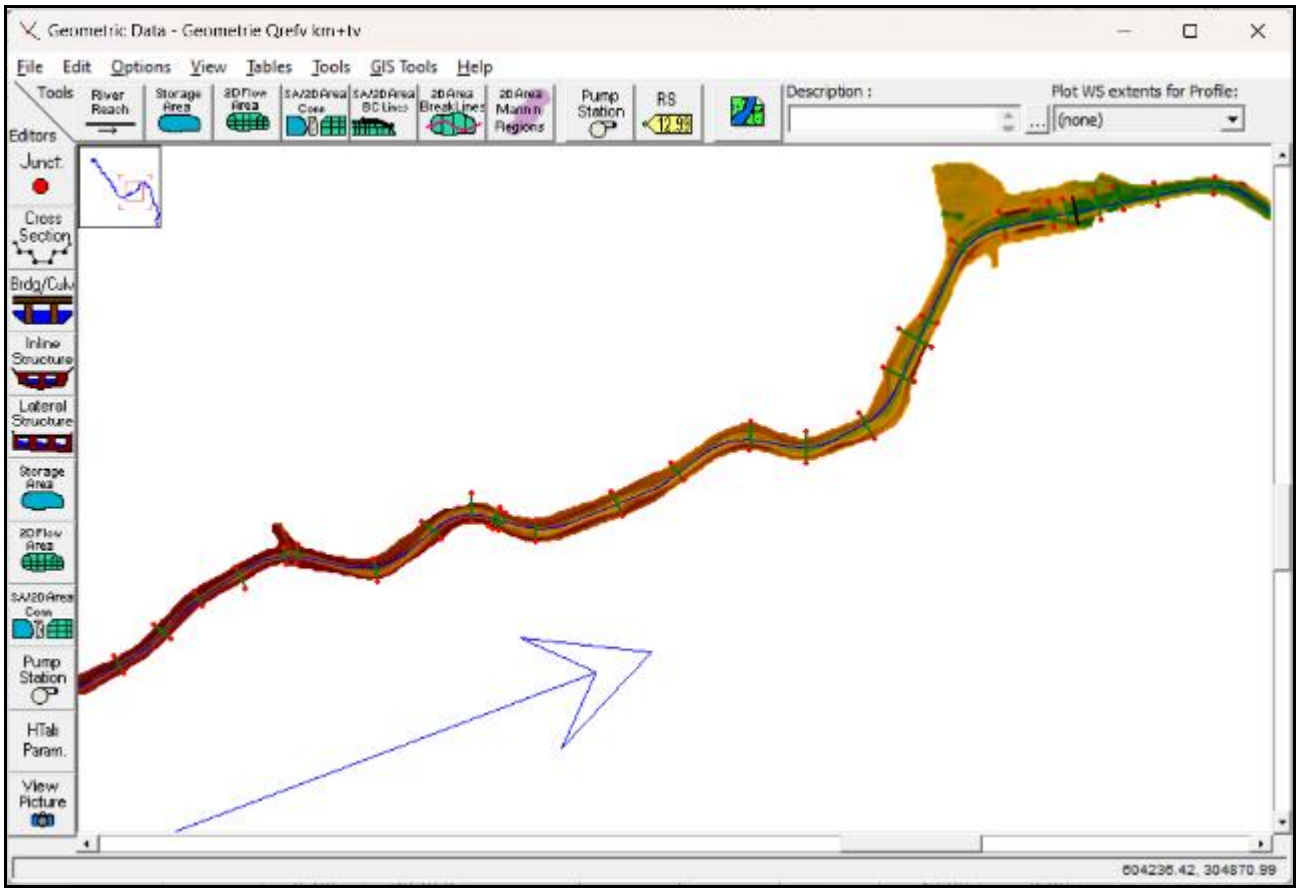


Figure no. 160 - HEC-RAS application - 1D hydraulic model developed along the Argeș river, on the analysed sector, in a developed riverbed regime - navigable canal

On the basis of the calibrated hydrological data in the existing riverbed, the hydraulic model was run in a developed riverbed regime - navigable canal for the maximum discharges with exceedance probabilities of 1% and 0.1% on the design section, by simulating the manoeuvres at the hydraulic nodes.

In the case of flood wave propagation with a probability of exceeding 1%, along the Argeș River in the case of a developed riverbed - navigable canal at the hydrotechnical nodes, the initial level was considered at NRL and manoeuvres were considered at the following works: the bottom discharge conduits of the hydroelectric power plant, the galleries of the lock supply and emptying system, the tainer gates of the overflow weir, without discharging through the locks (Fig. 161).

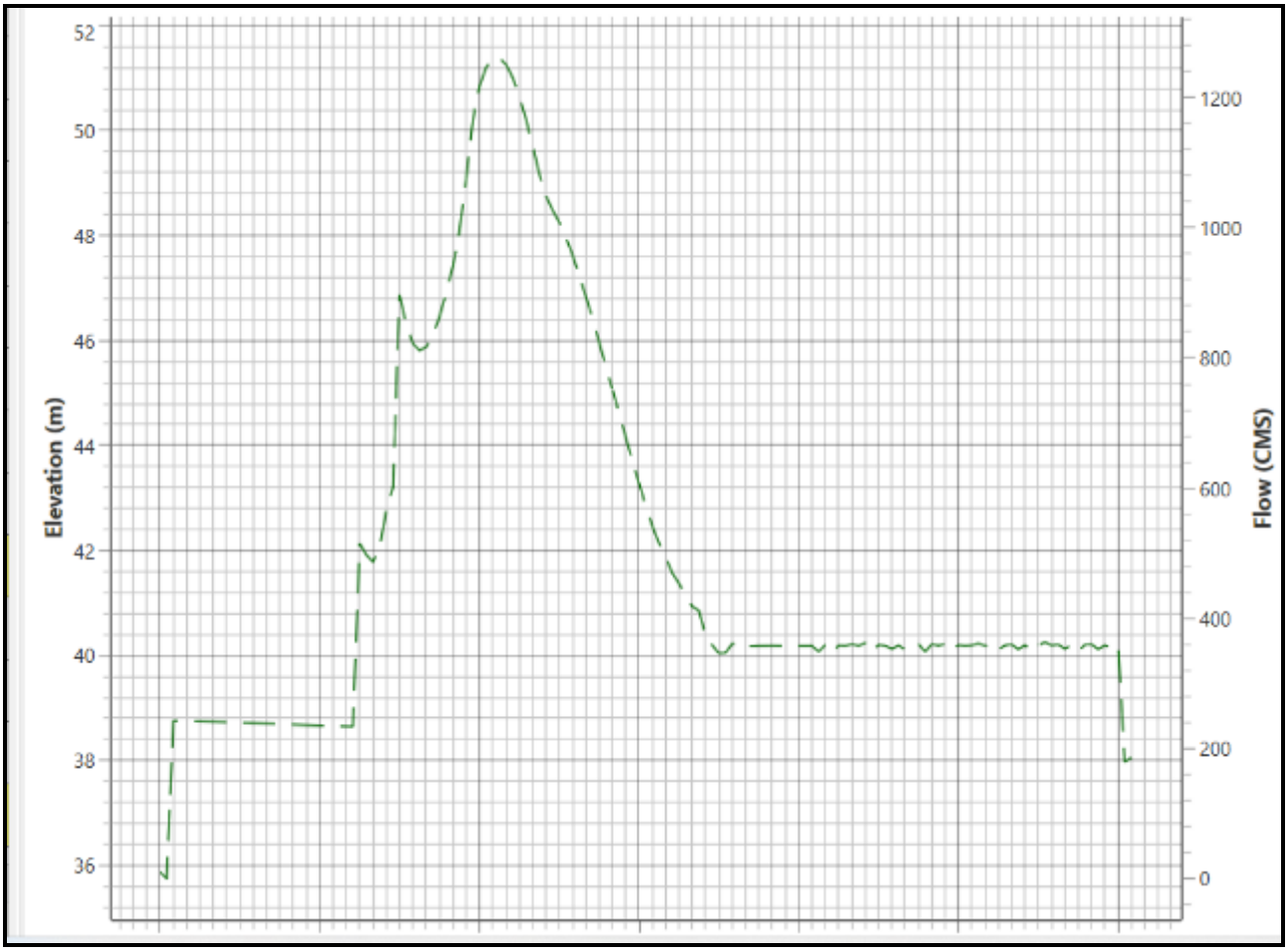
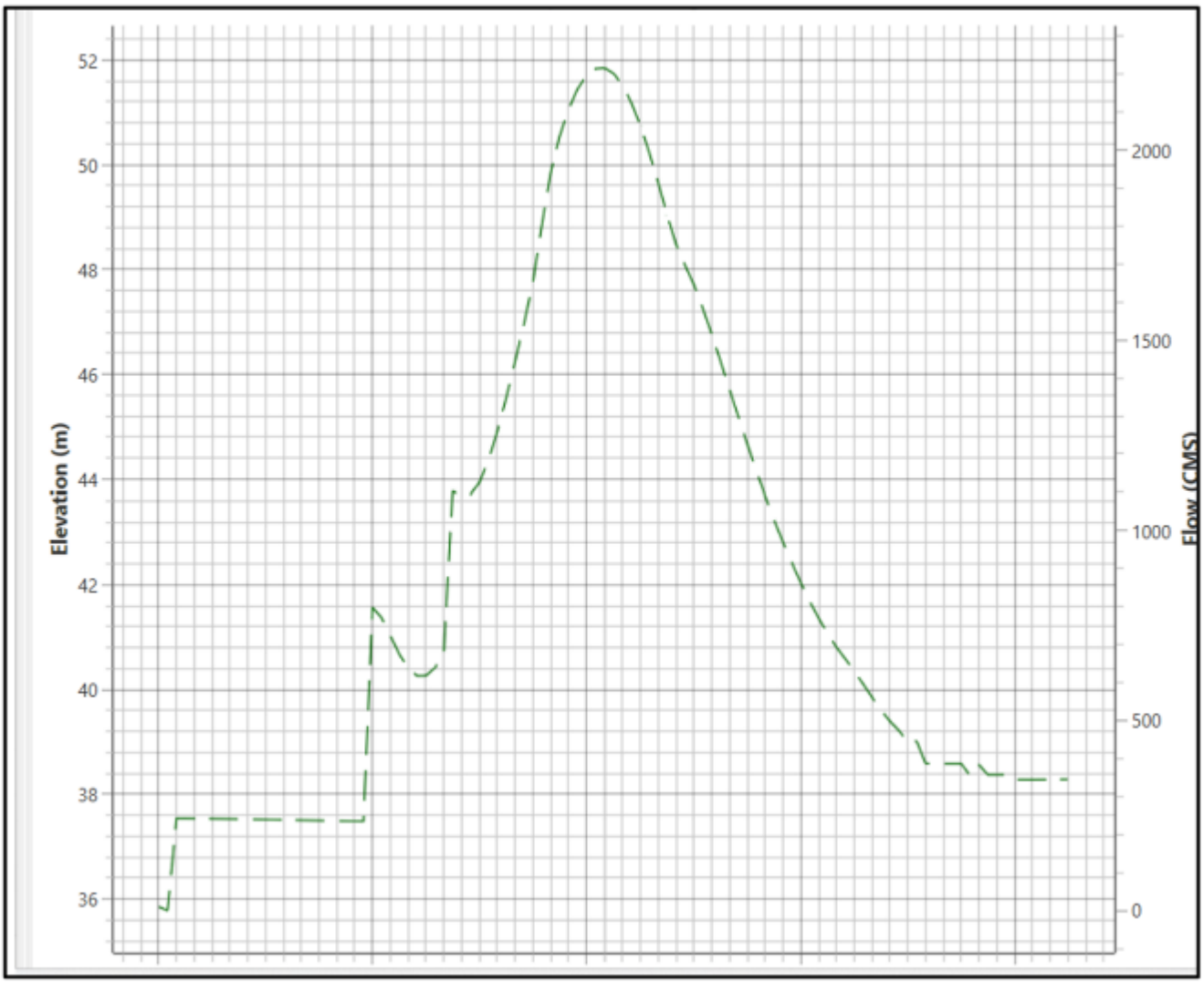


Figure no. 161 - Flow hydrograph with 1% exceedance probability obtained by modelling in HN3 section

In the case of flood wave propagation with a probability of exceeding 0.1%, along the Argeș River in the case of a developed riverbed - navigable canal at the hydrotechnical nodes, the initial level was considered at NRL and manoeuvres were considered at the following works: the bottom discharge conduits of the hydroelectric power plant, the galleries of the lock supply and emptying system, the tainer gates of the overflow weir, with discharging by manoeuvring a single lock.



The results of the calculations in the current hydrological regime in the conditions of the developed bed - navigable canal, carried out in non-permanent movement, for the maximum discharges with probabilities of exceedance of 1% and 0.1% on the Argeș River in the analysed sector are presented in the following table:

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Water level	Average speed
P141	1%	1295.0	81253.6	66.5	75.4	75.4	71.32	1.13
	0.1%	2250.0					75.36	1.15
P140	1%	1294.1	80918.6	66.3	74.7	74.7	71.31	1.84
	0.1%	2248.6					75.36	1.9
P139	1%	1293.2	80610.0	66.2	74.8	74.8	71.3	0.86
	0.1%	2247.1					75.36	0.93
P138	1%	1292.7	80460.0	66	74.8	74.8	71.3	0.63
	0.1%	2246.4					75.35	0.72
P137	1%	1292.6	80177.8	65.8	74.1	74.1	71.3	0.5
	0.1%	2244.5					75.35	0.65
P136	1%	1290.2	79785.2	65.6	75.4	75.4	71.26	0.96
	0.1%	2242.4					75.32	1.05
P135	1%	1289.5	79484.1	65.4	74.6	74.6	71.23	1.03
	0.1%	2241.4					75.31	1.04
P134	1%	1289.3	79078.8	65.2	73.5	73.5	71.22	0.86

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Water level	Average speed
	0.1%	2241.1					75.31	0.88
P133	1%	1289.2	78631.4	65	72.95	72.95	71.12	1.45
	0.1%	2241.1					75.21	1.5
P132	1%	1289.2	78389.7	64.8	72.9	72.9	71.09	1.45
	0.1%	2241.1					75.19	1.51
P131	1%	1289.2	77955.0	64.6	73	73	70.87	2.37
	0.1%	2241.1					75.06	2.42
P130	1%	1289.2	77760.4	64.4	72.9	72.9	70.85	2.31
	0.1%	2241.1					75.04	2.38
P129	1%	1289.1	77197.2	64.2	73.1	73.1	70.82	1.09
	0.1%	2241.1					75.02	1.14
P128	1%	1289.1	76864.4	64	73.1	73.1	70.8	1.14
	0.1%	2241.1					75	1.21
P127	1%	1289.0	76732.1	63.8	72.6	72.6	70.79	1.04
	0.1%	2241.1					75	1.12
P126	1%	1289.0	76473.6	63.7	72.6	72.6	70.66	2.47
	0.1%	2241.1					77.84	2.58
P125	1%	1289.0	76164.4	63.6	72.7	72.7	70.62	1.57
	0.1%	2241.1					74.8	1.67
P124	1%	1288.9	75858.8	63.5	74.8	74.8	70.52	1.87
	0.1%	2241.1					74.72	2
P123	1%	1288.9	75359.3	63.4	72.1	72.1	70.44	2.34
	0.1%	2241.1					74.61	2.47
P122	1%	1288.9	75195.5	63.3	71.2	71.2	70.4	1.57
	0.1%	2241.1					74.56	1.7
P121	1%	1288.8	74900.5	63.16	71.8	71.8	70.35	1.62
	0.1%	2241.1					74.48	1.75
P120	1%	1288.8	74761.0	63.1	71.4	71.4	70.23	2.08
	0.1%	2241.1					74.42	2.25
P119	1%	1288.8	74390.1	63	70.4	70.4	69.56	3.68
	0.1%	2241.1					72.67	4.49
P118	1%	1288.8	73942.1	62.96	68.9	68.9	67.31	4.11
	0.1%	2241.1					68.17	5.65
P117	1%	1288.8	73720.2	62.9	68.7	68.7	66.65	2.27
	0.1%	2241.1					67.89	2.98
P116	1%	1288.8	73575.6	62.8	68.4	68.4	66.59	1.54
	0.1%	2241.1					67.73	1.94
P115	1%	1288.7	73268.2	62.6	68	68	65.94	3.24
	0.1%	2240.8					66.98	4.13
P114	1%	1288.7	72944.1	62.6	68	68	65.65	2.74
	0.1%	2240.4					66.81	3.37
P113	1%	1287.9	72613.8	62.6	67.55	67.55	65.3	2.26
	0.1%	2239.4					66.77	2.29
Threshold	1%	1287.9	72257.8	62.6	67.55	67.55	65.3	2.26
	0.1%	2239.4					66.77	2.29
P112	1%	1287.9	71873.5	58.5	66.3	66.3	65.23	1.52

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Water level	Average speed
	0.1%	2239.4					66.67	2.13
P111	1%	1283.0	70179.5	58.5	66.1	66.1	65.16	0.76
	0.1%	2235.5					66.59	1.08
P110	1%	1282.3	69529.1	58.5	65.9	65.9	65.03	1.51
	0.1%	2233.9					66.34	2.15
P109	1%	1281.9	69076.0	58.5	65.9	65.9	64.87	1.92
	0.1%	2233.2					66.04	2.76
P108	1%	1281.4	68538.6	58.5	65.9	65.9	64.72	1.98
	0.1%	2232.9					65.77	2.86
P107	1%	1280.6	67653.6	57.81	65.85	65.85	64.59	1.83
	0.1%	2232.5					65.33	2.82
P106	1%	1279.7	66960.2	57.28	65.8	65.8	64.58	1.07
	0.1%	2232					65.32	1.69
P105	1%	1279.6	66875.8	57.21	65.5	65.5	64.57	0.59
	0.1%	2231.9					65.31	0.92
P104	1%	1279.5	66840.0	57.18	65.5	65.5	64.57	0.57
	0.1%	2231.8					65.31	0.88
P103	1%	1278.9	66661.1	57.05	65.5	65.5	64.57	0.58
	0.1%	2231.5					65.3	0.9
P102	1%	1278.5	66501.4	56.9	65.5	65.5	64.52	1.03
	0.1%	2231.3					65.2	1.63
P101	1%	1277.2	65577.7	56.2	65.5	65.5	64.47	1.18
	0.1%	2230.5					65.07	1.89
P100	1%	1276.3	64980.0	55.75	65.5	65.5	64.46	0.82
	0.1%	2229.9					65.04	1.34
P99	1%	1275.6	64612.1	55.45	65.5	65.5	64.45	0.55
	0.1%	2229.4					65.02	0.89
P98	1%	1275.4	64123.7	55.05	64.75	64.92	64.4	1.19
	0.1%	2228.8					64.89	1.93
P97	1%	1275.4	63392.8	54.5	64.6	64.77	64.4	0.84
	0.1%	2228.1					64.89	1.38
P96	1%	1275.4	62951.1	54.15	64.6	64.77	64.38	0.87
	0.1%	2227.6					64.85	1.44
P95	1%	1275.4	62353.0	53.7	64.6	64.77	64.38	0.69
	0.1%	2227					64.85	1.15
P94	1%	1275.4	62074.8	53.5	64.6	64.77	64.38	0.69
	0.1%	2226.6					64.83	1.14
P93	1%	1275.4	61963.1	53.5	64.6	64.77	64.37	0.69
	0.1%	2226.5					64.83	1.14
HN4	1%	1275.4	61883.1	53.5	64.6	64.77	64.37	0.69
	0.1%	2226.5					64.83	1.14
P92	1%	1275.4	61629.3	45.5	54.4	54.4	52.12	1.12
	0.1%	2226.5					53.35	1.63
P91	1%	1274.3	61200.4	45.5	53.7	53.7	52.09	1.12
	0.1%	2225.4					53.3	1.63
P90	1%	1273.1	60645.6	45.5	53.6	53.6	51.97	1.52

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Water level	Average speed
	0.1%	2224.7					53.08	2.22
P89	1%	1271.9	60068.0	45.5	53.4	53.2	51.88	1.53
	0.1%	2224.4					52.91	2.26
P88	1%	1269.6	59064.0	45.5	53.3	53.3	51.72	1.56
	0.1%	2223.7					52.59	2.35
P87	1%	1266.6	57797.3	45.5	53.1	53.1	51.56	1.4
	0.1%	2222.5					52.31	2.18
P86	1%	1266.1	57401.8	45.5	53.03	53.03	51.58	0.9
	0.1%	2221.9					52.25	1.4
P85	1%	1265.1	56700.1	45.5	53	53	51.56	0.79
	0.1%	2220.6					52.25	1.23
P84	1%	1264.0	55954.4	45.5	52.8	52.8	51.5	0.99
	0.1%	2219.3					52.13	1.56
P83	1%	1263.6	55554.2	44.9	52.5	52.5	51.44	1.25
	0.1%	2218.7					51.98	2
P82	1%	1262.6	54631.2	43.5	52.5	52.5	51.41	0.91
	0.1%	2217.4					51.92	1.49
P81	1%	1261.7	53889.7	42.4	52.5	52.5	51.4	0.77
	0.1%	2216.3					51.89	1.28
P80	1%	1261.0	53144.2	41.3	52.5	52.5	51.39	0.7
	0.1%	2216.1					51.86	1.16
P79	1%	1261.0	52606.2	40.5	52.5	52.5	51.39	0.65
	0.1%	2216.1					51.85	1.09
HN3	1%	1261.0	52346.2	40.5	52.5	52.5	51.39	0.65
	0.1%	2216.1					51.85	1.09
P78	1%	1261.0	52202.3	32.5	44.2	44.2	40.39	0.86
	0.1%	2216.1					42.32	1.24
P77	1%	1260.3	52088.4	32.5	44.2	44.2	40.39	0.86
	0.1%	2215.6					42.31	1.24
P76	1%	1258.1	51750.1	32.5	44.2	44.2	40.38	0.86
	0.1%	2214.1					42.3	1.25
P75	1%	1253.5	50966.2	32.5	44.2	44.2	40.3	1.17
	0.1%	2210.8					42.16	1.69
P74	1%	1326.0	50492.1	32.5	43.7	43.7	40.23	1.32
	0.1%	2254.9					42.07	1.78
P73	1%	1320.2	49188.8	32.5	43.7	43.7	40.12	1.29
	0.1%	2250.0					41.91	1.75
P72	1%	1314.1	47955.6	32.5	43.4	43.4	40.02	1.25
	0.1%	2245.3					41.77	1.72
P71	1%	1309.6	47161.7	32.5	43.1	43.1	39.99	1.05
	0.1%	2242.9					41.73	1.45
P70	1%	1540.7	46723.2	32.5	43.1	43.1	39.91	1.23
	0.1%	2577.1					41.62	1.63
P69	1%	1538.3	46073.1	32.5	43	43	39.89	1.02
	0.1%	2576.0					41.6	1.37
P68	1%	1535.5	45328.8	32.5	42.9	42.9	39.81	1.29

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Water level	Average speed
	0.1%	2574.8					41.47	1.72
P67	1%	1533.0	44553.3	32.5	42.7	42.7	39.67	1.61
	0.1%	2573.7					41.26	2.15
P66	1%	1530.5	43768.3	32.5	42.4	42.4	39.6	1.43
	0.1%	2572.5					41.16	1.92
P65	1%	1529.7	43401.6	32.5	42.2	42.2	39.53	1.54
	0.1%	2571.9					41.07	2.07
P64	1%	1528.3	42487.4	32.5	42	42	39.3	1.93
	0.1%	2570.5					40.69	2.62
P63	1%	1527.1	41761.2	32.5	41.8	41.8	39.19	1.71
	0.1%	2569.4					40.54	2.34
P62	1%	1525.8	41107.4	32.5	41.65	41.65	39.09	1.63
	0.1%	2568.1					40.39	2.24
P61	1%	1524.6	40483.5	32.5	41.6	41.6	38.95	1.78
	0.1%	2566.9					40.16	2.47
P60	1%	1523.0	39811.4	32.5	41.3	41.3	38.92	1.33
	0.1%	2565.4					40.13	1.85
P59	1%	1522.5	39650.2	32.5	41	41	38.89	1.4
	0.1%	2564.9					40.08	1.95
P58	1%	1519.5	38595.9	32.5	40.9	40.9	38.79	1.27
	0.1%	2563.5					39.93	1.78
P57	1%	1516.6	37687.5	32.05	40.82	40.82	38.72	1.19
	0.1%	2562.5					39.81	1.71
P56	1%	1515.0	37109.7	31.8	40.81	40.81	38.66	1.3
	0.1%	2561.8					39.69	1.88
P55	1%	1514.7	36811.6	31.65	40.7	40.7	38.55	1.72
	0.1%	2561.5					39.48	2.5
P54	1%	1514.6	36759.8	31.62	40.7	40.7	38.54	1.71
	0.1%	2561.4					39.48	2.5
P53	1%	1514.6	36687.6	31.6	40.7	40.7	38.54	1.71
	0.1%	2561.4					39.46	2.5
P52	1%	1514.1	36236.1	31.35	40.1	40.1	38.54	1.21
	0.1%	2560.8					39.43	1.79
P51	1%	1512.5	35099.7	30.8	39.9	39.9	38.5	0.99
	0.1%	2559.1					39.39	1.48
P50	1%	1511.3	34187.2	30.35	39.5	39.5	38.36	1.5
	0.1%	2557.8					39.09	2.28
P49	1%	1509.8	33097.0	29.85	39.5	39.5	38.35	0.83
	0.1%	2556.0					39.08	1.28
P48	1%	1508.6	32346.9	29.5	39.5	39.4	38.31	0.98
	0.1%	2554.6					39.99	1.51
P47	1%	1507.3	31495.9	29.1	39.4	39.5	38.27	1.04
	0.1%	2553.1					38.91	1.62
P46	1%	1505.9	30691.4	28.7	39.5	39.5	38.26	0.63
	0.1%	2551.8					38.89	1.01
P45	1%	1505.7	30160.4	28.45	39.5	39.5	38.26	0.62

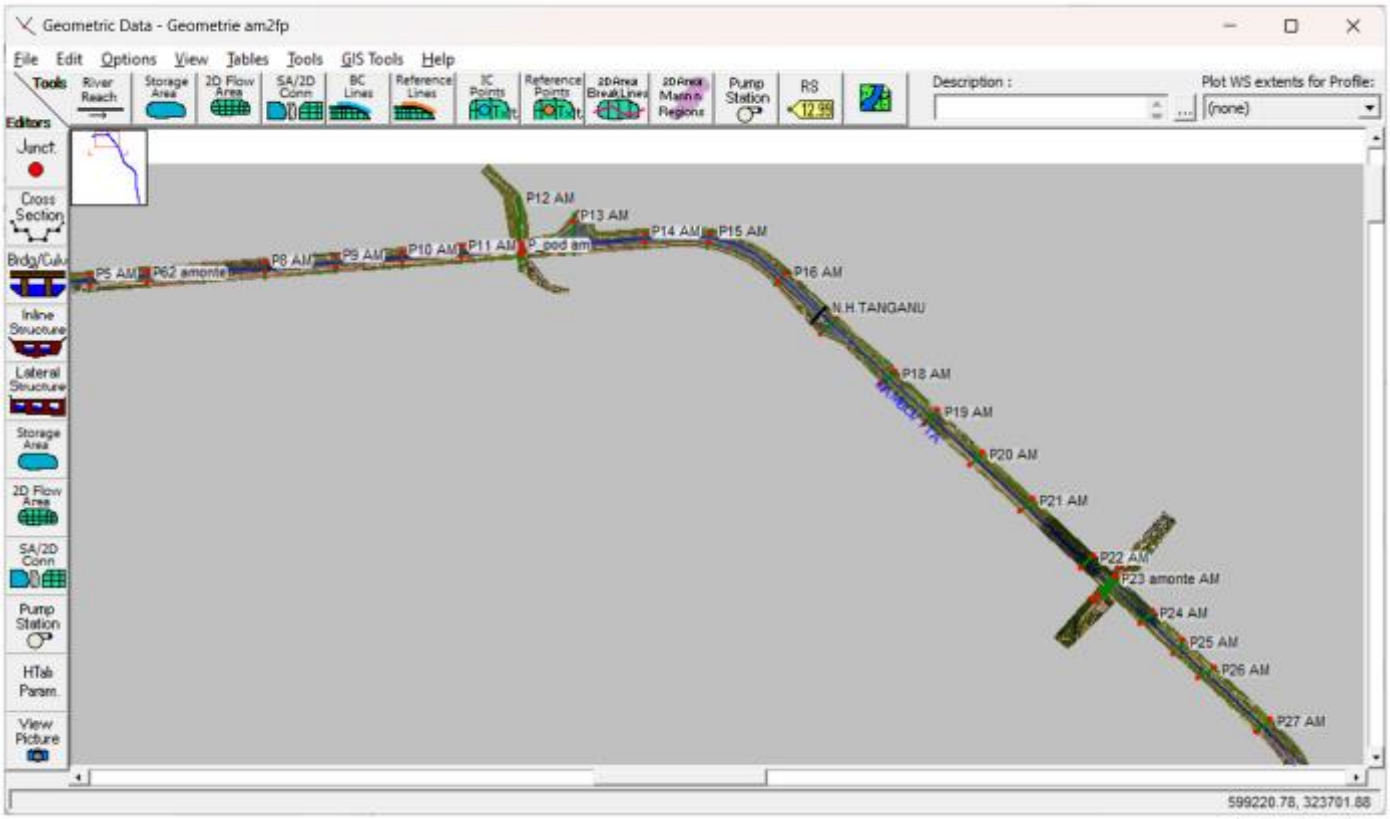
Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Water level	Average speed
	0.1%	2551.8					38.89	0.98
P44	1%	1505.7	29859.3	28.3	39.5	39.5	38.21	1.11
	0.1%	2551.8					38.79	1.76
P43	1%	1505.7	28826.8	27.8	39.5	39.5	38.21	0.61
	0.1%	2551.8					38.77	0.97
P42	1%	1505.7	28203.0	27.5	39.5	39.5	38.21	0.67
	0.1%	2551.8					38.76	1.07
P41	1%	1505.7	27549.1	27.5	39.5	39.5	38.21	0.67
	0.1%	2551.8					38.76	1.07
P40	1%	1505.7	27344.7	27.5	39.5	39.5	38.21	0.5
	0.1%	2551.8					38.76	0.8
HN2	1%	1505.7	27229.7	27.5	39.5	39.5	38.21	0.5
	0.1%	2551.8					38.76	0.8
P39	1%	1505.7	26923.2	19.5	31.49	31.49	28.37	0.83
	0.1%	2551.8					30.25	1.14
P38	1%	1504.7	26626.4	19.5	31.49	31.49	28.37	0.69
	0.1%	2551.0					30.25	0.96
P37	1%	1726.1	26130.4	19.5	31.27	31.27	28.26	1.38
	0.1%	2775.1					30.09	1.79
P36	1%	1723.9	25341.8	19.5	31.13	31.13	28.16	1.56
	0.1%	2773.4					29.94	2.01
P35	1%	1721.0	24264.8	19.5	30.88	30.88	27.97	1.79
	0.1%	2771.1					29.69	2.26
P34	1%	1715.4	22114.3	19.5	30.76	30.76	27.74	1.53
	0.1%	2765.8					29.44	1.98
P33	1%	1714.0	21604.6	19.5	30.65	30.65	27.74	0.81
	0.1%	2764.3					29.43	1.07
P32	1%	1712.5	21201.3	19.5	30.59	30.59	27.73	0.58
	0.1%	2763.4					29.42	0.77
P31	1%	1710.6	20719.9	19.5	30.5	30.5	27.7	0.9
	0.1%	2762.3					29.38	1.18
P30	1%	1708.8	20172.4	19.5	30.45	30.45	27.7	0.8
	0.1%	2761.3					29.37	1.06
P29	1%	1707.9	19834.9	19.5	30.3	30.3	27.55	1.79
	0.1%	2760.8					29.14	2.31
P28	1%	1706.5	19108.3	19.5	30.05	30.05	27.41	1.85
	0.1%	2759.9					28.95	2.39
P27	1%	1703.7	17696.3	19.5	29.84	29.94	27.27	1.48
	0.1%	2757.8					28.79	1.95
P26	1%	1703.2	17357.9	19.5	29.72	29.72	27.25	1.11
	0.1%	2757.2					28.75	1.47
P25	1%	1702.1	16574.9	19.5	29.47	29.47	27.09	1.75
	0.1%	2755.8					28.51	2.3
P24	1%	1701.0	15799.9	19.5	29.3	29.3	26.99	1.62
	0.1%	2754.5					28.37	2.15
P23	1%	1700.1	15209.6	19.5	29.02	29.02	26.9	1.63

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Water level	Average speed
	0.1%	2753.4					28.24	2.17
P22	1%	1698.8	14374.8	19.5	28.81	28.81	26.78	1.64
	0.1%	2751.8					28.05	2.2
P21	1%	1697.2	13387.3	19.5	28.6	28.6	26.58	1.8
	0.1%	2749.7					27.74	2.44
P20	1%	1696.7	13063.0	19.5	28.25	28.25	26.51	1.84
	0.1%	2749.0					27.62	2.49
P19	1%	1695.1	12095.5	19.1	28.04	28.04	26.47	1.15
	0.1%	2747.1					27.6	1.59
P18	1%	1694.4	11390.4	18.8	28.01	28.01	26.36	2.01
	0.1%	2746.4					27.4	2.82
P17	1%	1694.3	11293.2	18.7	27.6	27.6	26.24	1.09
	0.1%	2746.3					27.16	1.53
P16	1%	1692.9	9940.3	18.1	27.24	27.24	26.1	1.86
	0.1%	2744.7					26.92	2.67
P15	1%	1691.8	9056.9	17.7	26.86	26.86	26.08	0.91
	0.1%	2743.4					26.87	1.33
P14	1%	1690.9	8007.4	17.2	26.5	26.5	26.06	0.96
	0.1%	2741.5					26.84	1.4
P13	1%	1690.5	7000.3	16.8	26.5	26.5	25.96	1.33
	0.1%	2740.0					26.63	1.98
P12	1%	1690.2	6241.8	16.4	26.5	26.5	25.93	1.3
	0.1%	2739.0					26.57	1.95
P11	1%	1689.8	5526.3	16.1	26.5	26.5	25.92	0.74
	0.1%	2737.8					26.55	1.11
P10	1%	1689.5	4915.3	15.9	26.5	26.5	25.92	0.72
	0.1%	2736.4					26.52	1.08
P9	1%	1689.0	3817.2	15.4	26.5	26.5	25.82	1.38
	0.1%	2736.3					26.28	2.11
P8	1%	1688.9	3461.6	15.2	26.5	26.5	25.8	1.37
	0.1%	2736.3					26.26	2.1
P7	1%	1688.9	3364.2	15.2	26.5	26.5	25.8	0.94
	0.1%	2736.3					26.26	1.44
P6	1%	1688.9	2987.2	15.0	26.5	26.5	25.8	0.82
	0.1%	2736.3					26.26	1.25
P5	1%	1688.9	1917.7	14.5	26.5	26.5	25.79	0.79
	0.1%	2736.3					26.26	1.22
P4	1%	1688.9	1443.4	14.5	26.5	26.5	25.79	0.79
	0.1%	2736.3					26.26	1.22
HN1	1%	1688.9	1288.5	14.5	26.5	26.5	25.79	0.79
	0.1%	2736.3					26.26	1.22
P3	1%	1688.9	1042.9	6.0	20	20	14.73	1.74
	0.1%	2736.3					17.22	2.03
P2	1%	1688.9	494.2	6.0	20	20	14.64	1.76
	0.1%	2736.3					17.13	2.06
P1	1%	1688.9	0.0	6.0	20	20	14.56	1.78

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Water level	Average speed
	0.1%	2736.3					17.05	2.07

For the simulation of water flow for the propagation of flood waves with exceedance probabilities of 1% and 0.1%, *under the developed hydrological regime*, on the Dâmbovița river sector under the conditions of the Navigable Canal development, in the area of interest of the project, namely downstream Glina - upstream the confluence with the Argeș river, a 1D hydraulic model was developed by introducing on the alignments the characteristic sections designed both along the canal and in the sections of the hydrotechnical nodes of Tânganu and of Cucuieți, as specified in the project (typical cross-sections, longitudinal profile, route designed under variant II, as the sections of the bridges to be redeveloped, they were not considered) on the whole river section, on a non-permanent basis.

The roughness coefficients adopted in accordance with the recommendations of the "HEC - RAS - River Analysis System - Hydraulic Reference Manual", taking into account the characteristics of the designed sections, had the following values:



Variable between 0.025 - 0.03 in the minor riverbed and between 0.05 -0.06 in the major riverbed of the Dâmbovița river

On the basis of the calibrated hydrological data in the existing riverbed, the hydraulic model was run in a developed riverbed regime - navigable canal for the maximum discharges with exceedance probabilities of 1% and 0.1% on the design section, by simulating the manoeuvres at the hydraulic nodes.

In case of propagation of flood waves with probabilities of exceeding of 1% and 0.1%, along the Dâmbovița river in the scenario of a developed bed - navigable canal, at the hydrotechnical nodes, the initial level was considered at NRL and manoeuvres were considered at the tainer gates of the overflow weir, with the downstream limit condition being the corresponding maximum levels resulting on the Argeș river in the link area between the two upstream canals HN 2 of Budești (Level 1% = 38.21 mdMN, Level 0.1% = 38.77 mdMN) (fig. 162 - 163).

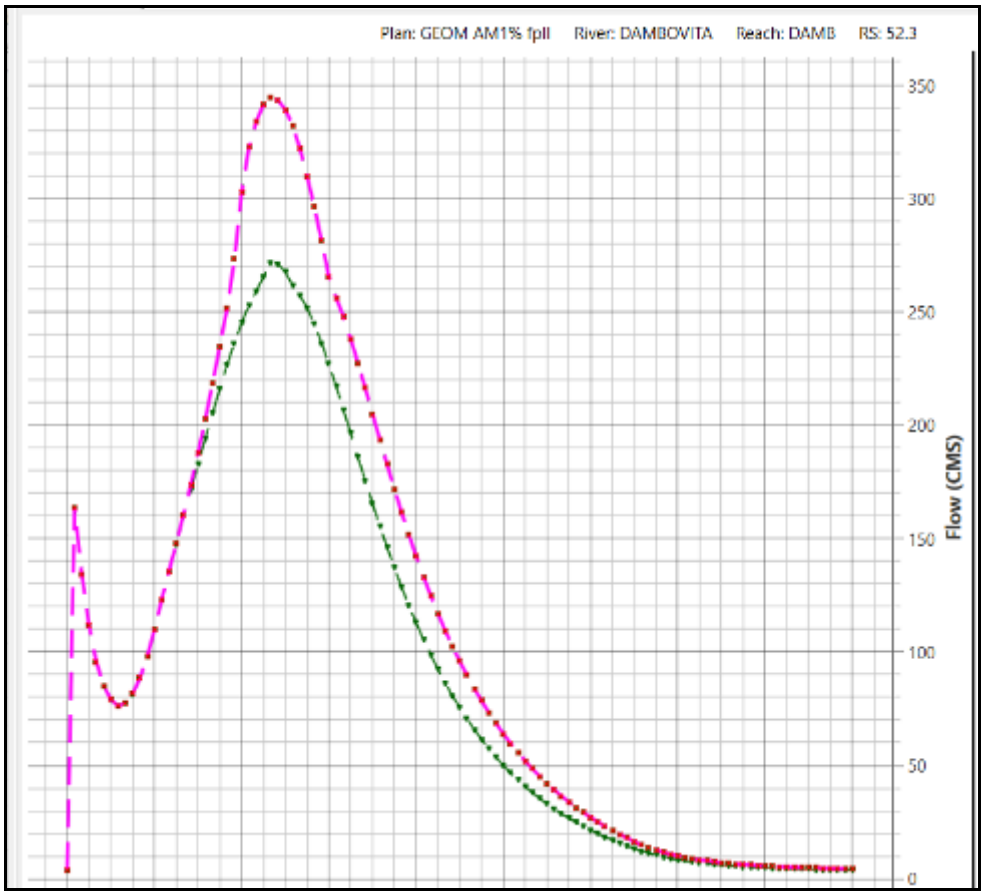


Figure no. 162 - Flow hydrograph with exceedance probabilities of 1% and 0.1% obtained by modelling in the Tânganu HN section

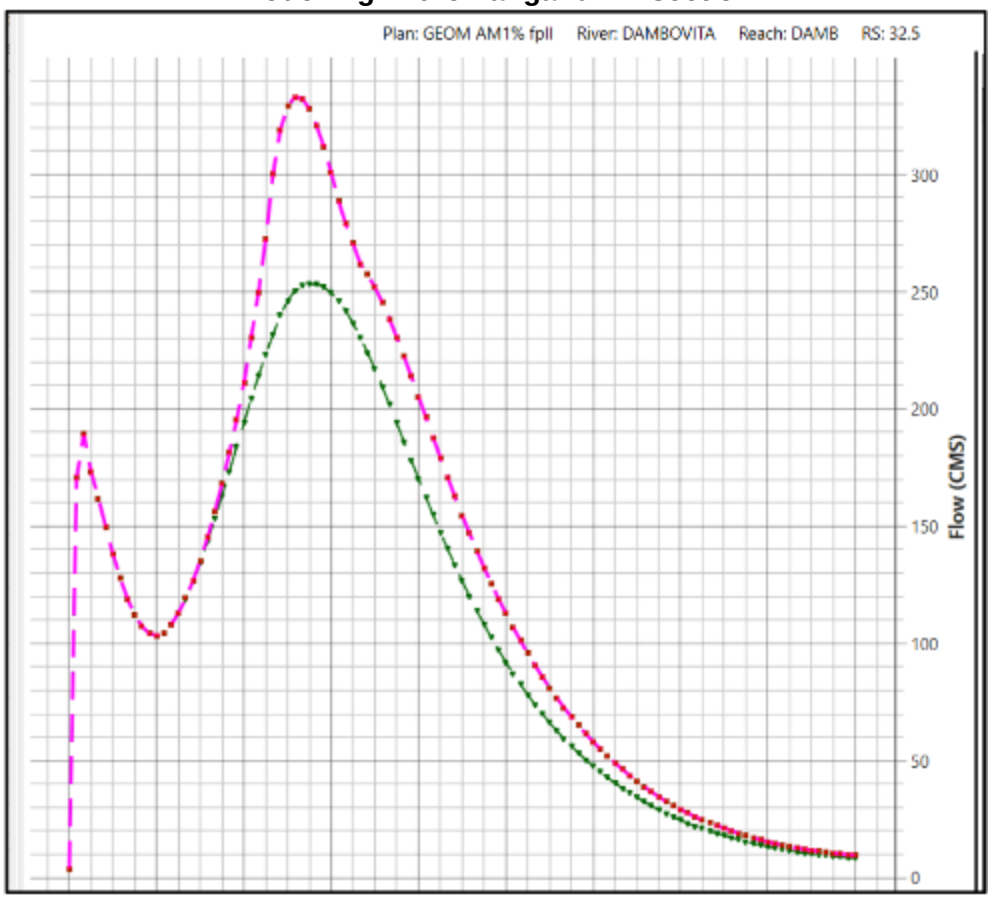


Figure no. 163 - Flow hydrograph with exceedance probabilities of 1% and 0.1% obtained by modelling in the Cucuieți HN section

The results of the calculations in the current hydrological regime in the conditions of the developed bed - navigable canal, carried out in non-permanent movement, for the maximum discharges with probabilities of exceedance of 1% and 0.1% on the Dâmbovița river in the analysed sector are presented in the following table:

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Level	Average speed
P2	1%	160	29855.8	46.5	54.5	55	52.33	0.25
	0.1%	200.0					52.63	0.26
P3	1%	160	29314.1	46.5	55.73	55.29	52.33	0.22
	0.1%	200.0					52.63	0.23
P4	1%	160	28862.8	46.5	54.99	53.38	52.33	0.2
	0.1%	200.0					52.63	0.21
P5	1%	160	28388.3	46.5	53.59	54.82	52.32	0.29
	0.1%	199.5					52.62	0.3
P6 upstream	1%	159.8	27970	46.5	52.75	52.6	52.31	0.39
	0.1%	199.5					52.61	0.42
P6 downstream	1%	159.8	27966	46.5	52.75	52.6	52.31	0.39
	0.1%	199.3					52.61	0.42
P7	1%	159.8	27557.5	46.5	53.1	53.24	52.3	0.42
	0.1%	199.3					52.6	0.47
P8	1%	159.8	27114.8	46.5	53.25	54.14	52.29	0.47
	0.1%	199.0					52.58	0.54
P9	1%	159.8	26598.3	46.5	52.64	52.58	52.27	0.55
	0.1%	199.0					52.56	0.64
P10	1%	159.7	26119.8	46.5	52.64	53.05	52.24	0.66
	0.1%	198.8					52.52	0.78
P11	1%	159.7	25683.9	46.5	52.58	52.61	52.21	0.8
	0.1%	198.8					52.47	0.94
P12	1%	159.7	25265.6	46.5	51.24	51.34	52.18	0.8
	0.1%	198.8					52.43	0.96
P_bridge upstream	1%	159.7	25252.2	46.5	53.13	52.46	52.17	0.92
	0.1%	198.7					52.41	1.1
P_bridge downstream	1%	159.7	25240.8	46.5	53.13	52.46	52.16	0.92
	0.1%	198.7					52.41	1.11
P13	1%	159.7	24872.6	46.5	50.98	51.48	52.15	0.92
	0.1%	198.7					52.41	1.11
P14	1%	260	24352.8	46.5	50.69	50.67	52.15	0.27
	0.1%	345.0					52.37	0.33
P15	1%	260	23886.3	46.5	49.8	49.53	52.13	0.86
	0.1%	345.0					52.36	1.11
P16	1%	260	23280.9	46.5	49.8	49.53	52.11	0.66
	0.1%	345.0					52.33	0.8
HN of Tanganu	1%	260	22901	46.5	49.8	49.53	52.11	0.67
	0.1%	345.0					52.33	0.81

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Level	Average speed
P17	1%	260	22791.6	39.8	46.8	46.8	45.21	0.62
	0.1%	344.4					45.67	0.74
P18	1%	260	22213.1	39.8	46.8	46.8	45.17	0.78
	0.1%	344.4					45.62	0.92
P19	1%	260	21798	39.8	46.8	46.8	45.15	0.78
	0.1%	344.4					45.59	0.92
P20	1%	260	21354.5	39.8	46.8	46.8	45.12	0.79
	0.1%	343.6					45.56	0.94
P21	1%	259.8	20861.4	39.8	46.8	46.8	45.09	0.79
	0.1%	343.6					45.52	0.95
P22	1%	259.8	20263.9	39.8	46.8	46.8	45.06	0.79
	0.1%	343.6					45.48	0.95
P22.5	1%	259.8	20051	39.8	46.8	46.8	45.04	0.8
	0.1%	342.7					45.46	0.96
P23_amonte	1%	259.8	20041	39.8	46.8	46.8	45.04	0.8
	0.1%	342.7					45.46	0.96
P23_aval	1%	259.8	20031	39.8	46.8	46.8	45.04	0.8
	0.1%	342.7					45.46	0.96
P23.5	1%	259.7	20011	39.8	46.8	46.8	45.04	0.8
	0.1%	341.9					45.46	0.96
P24	1%	259.7	19671.4	39.8	46.8	46.8	45.02	0.8
	0.1%	341.9					45.43	0.96
P25	1%	259.7	19356.6	39.8	46.8	46.8	45	0.8
	0.1%	341.9					45.4	0.96
P26	1%	259.7	19081.8	39.8	46.8	46.8	44.98	0.81
	0.1%	341.9					45.38	0.97
P27	1%	259.7	18516.1	39.8	46.8	46.8	44.95	0.81
	0.1%	340.8					45.33	0.97
P28	1%	259.7	18039.5	39.8	46.8	46.8	44.92	0.82
	0.1%	340.8					45.29	0.99
P29a	1%	258.4	17632.2	39.8	46.8	46.8	44.89	0.82
	0.1%	340.8					45.25	0.99
P30	1%	258.4	17123.5	39.8	46.8	46.8	44.85	0.83
	0.1%	340.8					45.2	1.01
P31	1%	258.4	16623	39.8	46.8	46.8	44.82	0.83
	0.1%	340.8					45.15	1.02
P32	1%	258.4	16224.6	39.8	46.8	46.8	44.79	0.84
	0.1%	340.8					45.11	1.02
P33	1%	257.9	15769.4	39.8	46.8	46.8	44.76	0.84
	0.1%	340.0					45.07	1.02
P34	1%	257.9	15433.3	39.8	46.8	46.8	44.73	0.84
	0.1%	340.0					45.03	1.03
P35	1%	257.9	15193.1	39.8	46.8	46.8	44.71	0.86
	0.1%	340.0					45	1.06
P36	1%	257.9	14721.6	39.8	46.8	46.8	44.71	0.86

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Level	Average speed
	0.1%	340.0					45	1.06
HN of Cucuieti	1%	257.9	14660	39.8	46.8	46.8	44.71	0.86
	0.1%	340.0					45	1.06
P37	1%	257.9	14268.1	32.5	38	38	38.67	0.53
	0.1%	340.0					39.28	0.82
P38	1%	256.6	13798.7	32.5	38	38	38.66	0.53
	0.1%	340.0					39.26	0.82
P39	1%	256.6	13298.4	32.5	38	38	38.64	0.53
	0.1%	339.4					39.23	0.82
P40	1%	256.6	12708.2	32.5	38	38	38.63	0.53
	0.1%	339.4					39.2	0.83
P41	1%	256.6	12203.7	32.5	38	38	38.62	0.54
	0.1%	339.4					39.18	0.83
P42	1%	256.6	11661.2	32.5	38	38	38.61	0.54
	0.1%	339.4					39.15	0.84
P43	1%	256.2	11182.4	32.5	38	38	38.6	0.54
	0.1%	339.4					39.13	0.84
P44	1%	256.2	10827.9	32.5	38	38	38.59	0.54
	0.1%	339.4					39.11	0.84
P45	1%	256.2	10402.8	32.5	38	38	38.58	0.54
	0.1%	339.4					39.1	0.84
P46	1%	256.2	9857.9	32.5	38	38	38.56	0.54
	0.1%	339.4					39.09	0.84
P47	1%	256.2	9089.3	32.5	38	38	38.54	0.54
	0.1%	339.4					39.07	0.84
P48	1%	256.2	8710.9	32.5	38	38	38.53	0.54
	0.1%	339.4					39.06	0.84
P49	1%	256.2	8239	32.5	38	38	38.51	0.54
	0.1%	339.4					39.05	0.84
P50	1%	256.2	7743.3	32.5	38	38	38.49	0.54
	0.1%	339.4					39.03	0.84
P51	1%	255.6	7270.6	32.5	38	38	38.47	0.54
	0.1%	339.0					39.01	0.84
P52	1%	255.6	6806	32.3	38	38	38.46	0.54
	0.1%	339.0					39.01	0.84
P53	1%	255.6	6277.1	32	38	38	38.45	0.49
	0.1%	339.0					39	0.54
P54	1%	255.6	5751.3	31.7	38	38	38.44	0.49
	0.1%	339.0					38.99	0.54
P55	1%	255.6	5244.3	31.4	38	38	38.43	0.49
	0.1%	339.0					38.98	0.54
P56	1%	255.6	4875.1	31.2	38	38	38.42	0.49
	0.1%	339.0					38.98	0.54
P57	1%	255.6	4342.2	30.9	38	38	38.41	0.48
	0.1%	339.0					38.97	0.53
Rv1	1%	255.6	4134.1	30.8	38	38	38.4	0.47

Profile	p%	Q p%	Cumulative distance	Thalweg	Left bank	Right bank	Level	Average speed
upstream	0.1%	339.0					38.96	0.51
Rv1 downstream	1%	255.3	4124.1	30.8	38	38	38.4	0.47
	0.1%	339.0					38.96	0.51
P58	1%	255.3	3707.5	30.6	38	38	38.39	0.36
	0.1%	338.5					38.95	0.42
P59	1%	255.3	3187.7	30.3	38	38	38.37	0.34
	0.1%	338.5					38.93	0.38
P60	1%	255.3	2669.3	30	38	38	38.35	0.33
	0.1%	338.5					38.91	0.35
P61	1%	255.3	2301.3	29.8	38	38	38.33	0.32
	0.1%	338.5					38.89	0.33
P62	1%	255.3	1774.2	29.5	38	38	38.3	0.31
	0.1%	338.5					38.86	0.32
P63	1%	255.3	1454.4	28	38	38	38.28	0.3
	0.1%	338.5					38.84	0.31
P64	1%	255.3	1213.6	28	38	38	38.27	0.29
	0.1%	338.5					38.83	0.3
P65	1%	255.1	506.8	28	38	38	38.22	0.29
	0.1%	338.5					38.78	0.3
P66	1%	255.1	0	28	38	38	38.21	0.29
	0.1%	338.2					38.77	0.3

Flood defence measures for port developments provide for the **inner slopes to be provided with protection, defence and reinforcement works**. Their type was chosen according to the demands they are subjected to and the water level, with the aim of significantly minimising seepage from the development section and protecting adjacent land.

When the normal retention level (NRL) in each individual reach is less than 1.00 m above the general level of the surrounding land, the inner slope of the section will be protected with a concrete impermeable revetment up to the water level with a 1% exceedance probability.

If the difference in level between the water level with 1% exceedance probability and the NRL is less than 1.0 m, the slope protection will be defended up to the NRL height + 1.00 m (wave defences with wave runup).

At the bottom the slope protection is extended in depth as shown below:

- When the normal retention level (NRL) of the respective reach is between -1.0 m and +1.0 m above the general level of the adjacent land, the project provides thin walls/diaphragms of bentonite slurry with a thickness of about 10 cm and a depth of 8.0-10.0 m.

- When the normal retention level (NRL) in the reach is between +1.0 m and +3.0 m above the general level of the adjacent land, the project provides a 40 cm thick concrete cut-off wall made of bentonite slurry and embedded 1.0 m into the impervious clay or marl layer. The maximum depth of this type of wall is 25 metres. If no impervious layers have been found up to this depth, the wall remains floating.

- If the normal retention level (NRL) in the reach is higher than +3.0 m above the general level of the adjacent land, the project provides the construction of 60 cm thick concrete cut-off walls made of bentonite slurry, embedded 1.0 m into impervious layers. The depth of this type of cut-off wall is up to 35.0 metres. If no impervious layers have been found up to this depth, the walls stop at 35.0 m.

When the normal retention level (NRL) in the reach is lower than -1.0 m from the general level of the adjacent land, the inner slope of the section is protected against the action of waves and wind by means of construction solutions with pervious works (raw stone on filter layers, precast concrete slabs or cast-in-place concrete, with weepers placed at a distance of approx. 1.0 ... 1.5 m). Such works will be carried out up to the water level with an 1% exceedance probability or at least NRL + the height of the navigation wave (NRL + 1.0 m). Above the water level with a 1% exceedance probability of the inner slopes is of the light type (cores made of prefabricated elements filled with topsoil, grassed).

6.5.2.5 Thunderstorms and wind gusts

Wind is the climate element that best reflects the influence of the general atmospheric circulation.

According to the Report of the National Meteorological Administration (2015): *"Climate Change - From the Physical Basis to Risks and Adaptation*", wind speed shows major changes in terms of its long-term evolution. Annual mean wind speed decreases of 93% were recorded at all stations in Romania. The available data leads to the conclusion that there will be a reduction in the average wind speed in the project reference area.

With regard to extreme wind speeds (thunderstorms, tornadoes), "*Tornadoes in Romania*" (B. Antonescu, A. Bell - 2014) shows that they are possible in the project area, but are not a characteristic of the site.

In the area of the site, according to the available data, there are no known cases of extreme storms, wind gusts that jeopardise the activity in the navigable canal or that affect the utility networks (electricity, water, etc.) in the area of the hydrotechnical constructions.

6.5.2.6 Landslides

There is no danger of landslides in the project area, as can be seen in the figure below.

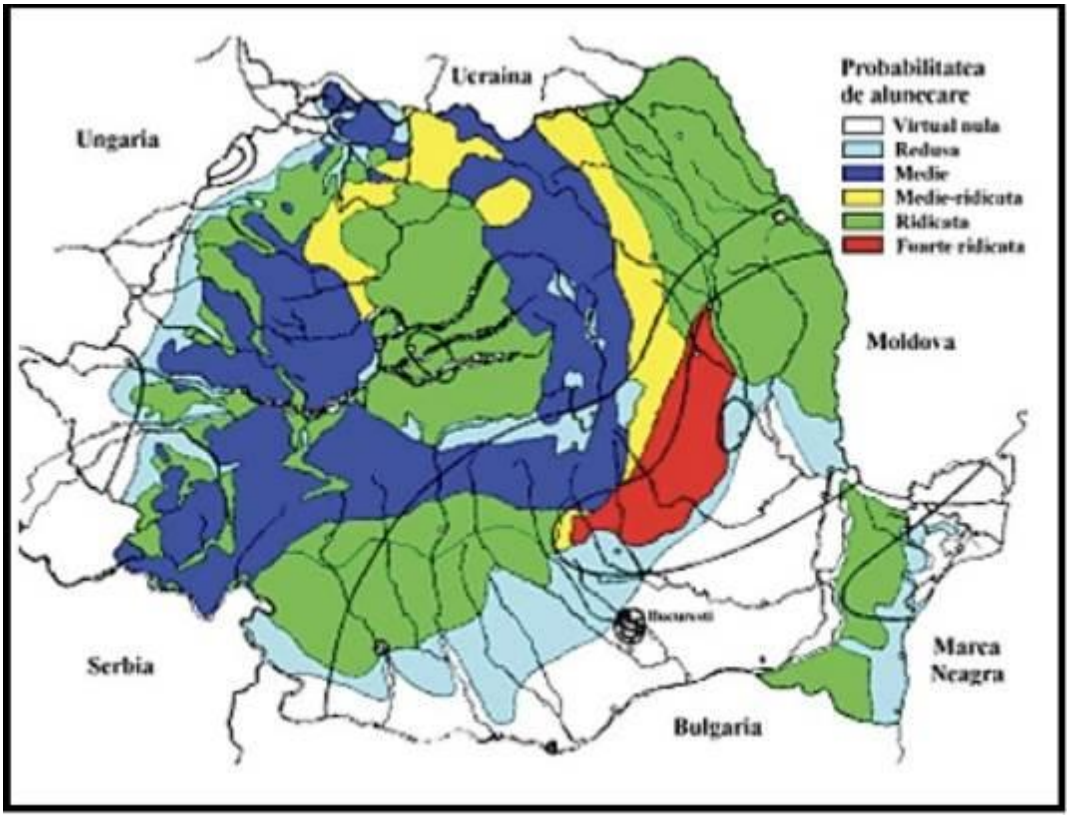


Figure no. 164 - Landslides map

The existing construction works are stable, based on geotechnical studies, therefore the risk is very low.

Those to be made will also be based on the provisions of the geotechnical studies, corroborated with the technical part proposed by specialists.

6.5.2.7 Sea level rise, storms, waves, coastal erosion, hydrological regimes and saline intrusion

The project area will not be influenced by sea level rise, sea storms, coastal erosion, etc.

6.5.2.8 Cold spells

Chapter 4.3. and Annex 10 of this report describe in detail the climatic variations in the study area.

Analysing the extreme temperatures recorded in 2022-2023 compared to the data of the last 30 years (1990 - 2020), the same trends can be observed from the analysis of the data published in the Statistical Yearbook of Romania. Therefore, we cannot talk about maximum temperatures above historical highs, but we can see an increase in lows and therefore **a general warming trend and a reduction in the risk of frost**.

For the project that is the subject of this study, the materials envisaged are of high quality to withstand low or high temperatures, so that there will be no risk during periods when there may be cold spells, despite the trend resulting from the above.

Also, as mentioned above, the project is based on a geotechnical study carried out in the area of the site, so that when designing the works, the location of the utility supply networks (especially those for water supply) took into account the maximum frost depth, so that the positioning of the pipes is below this depth to minimise the risk of water supply interruption due to frost.

The port activity as well as navigation (if the situation so requires) will be temporarily interrupted in situations where the phenomenon of frost / icy shore occurs, which may prevent navigation and/or mooring of ships on the shore, or, where such situations also exist.

6.5.2.9 Freeze-thaw damage

There is no such risk, as the materials proposed to be used for the works are of good quality, resistant to temperature differences.

6.5.2.10 Climate change vulnerability on people and assets

On the basis of all the data, information and conclusions presented in this report concerning the type of works proposed, the impact they may have on environmental factors, climatic factors, the impact the project may have on climatic factors and the impact of climatic factors on the project, it is worth mentioning that:

- in the event of flooding in the area of the canal/ports site as a result of heavy rain, etc., there is a risk of flooding in the area. According to the maps made available by the Romanian water management authority (ANAR), the flooding bands extend as far as the area after the port platform, so that the population working in the port area, as well as the companies for which goods are brought to the port area, transport vessels, road / railway infrastructure in the area of the sites, etc. may be affected. This risk is low given the long-term climatic trends
- Another potential source of impact could be the drought, which leads to a drop in the water level on the two rivers (Argeș and Dâmbovița) making it impossible for ships to navigate and/or moor in the ports. This impact can be translated into a socio-economic impact on the port economy as well as on the population working in the port area, on the companies that depend on the port's cargo traffic.

It should be noted that although these risks exist, the probability of their defence is low and most importantly, they do not depend on the works proposed by this project (they are not influenced by the works proposed for execution, the activity carried out, the materials used, etc.).

6.6 Estimated impacts on environmental factors

6.6.1. Water

6.6.1.1 Analysing the impact of works on water bodies

The purpose of this project is to develop the Argeș and Dâmbovița rivers for navigation and other uses, as described in the previous chapters.

The surface water bodies on which these works will be carried out are:

- Dâmbovița: downstream of Morii Lake - upstream of the discharge Apa Nova (Glina) (code RORW10-1-25_B8);
- Dâmbovița: upstream of the discharge Apa Nova (Glina) - conf. Argeș (code RORW10-1-25_B9);
- Argeș: section upstream the confluence with Dâmbovița river - confluence with the Danube (code RORW10-1_B7);
- Argeș: section downstream of Mihăilești - upstream of the confluence with Dâmbovița river (code RORW10-1_B6).

With the implementation of the proposed works, it is expected that hydromorphological effects on water bodies, as analysed in the *Water Body Assessment Study (WBAS)* and summarised in Tables 44-47, will also occur, which could be beneficial both for the navigability purpose of the project and for the environment.

According to the analysis in the tables below (cause-effect analysis for the water bodies) it can be understood that, as the works in this documentation are of a large scale, there is thus also a possible **moderate impact** on the water bodies involved.

Here we refer in particular to the modification of hydromorphological parameters, which in turn may have a possible negative impact on other environmental components - quality indicators of water bodies.

Table 44 - *Cause-effect mechanisms for water bodies*
Surface water body RORW10-1-25_B8 - Dâmbovița: downstream of Lacul Morii reservoir - control works for discharge of Apa Nova (Glina)

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be temporary? Yes / No / Unsure	Justification	Will the effect be insignificant for the water body? Yes / No / Unsure	Justification
Hydromorphological elements				
Hydrological regime: flow quantity and dynamics	NO	With the creation of the fairway and the proposed port, the quantity and dynamics of the flow in the water body is anthropized, in the sense that, when the vessels that are to use the respective section cross the fairway, the flow is modified on a case-by-case basis. In contrast, during the time when the fairway or port is not in use, the flow is normal and secured so as not to alter other environmental or hydromorphological factors.	NO	The manner of design of both the fairway and the port at waterbody level means that, when ships are travelling on the current section, the amount and dynamics of the flow will change according to each individual requirement, but when the works are commissioned the changes in the amount and dynamics of the flow in relation to their normal values are major.
Lateral river continuity	YES	As specified in the previous table, the only work with an impact on the lateral continuity is the closure embankment that follows the county road line and is embedded in the natural land elevation, and the capacity of the floodplain to take floods over is insignificantly diminished, thus the effect is to be temporary.	YES	The analysis of lateral connectivity is based, according to the PNMBHD, on the analysis of the extent to which the connectivity of the watercourse with the riparian/floodplain area is maintained (capacity of the floodplain area to take floods), thus by the implementation of the project this is maintained, as the embankment works are specifically designed to take the flush floods and stop flooding. At the same time, the works with potential effect on the indicator are on a reduced length in relation to twice the length of the water body, namely 3.2%
Morphological conditions: river depth and width	NO	The effect of the works within the framework of the development of the navigable fairway and the rehabilitation of the port of Glina will be permanent. The affected area at the water body level is strictly in the area of the	YES	In order to evaluate the status of this indicator according to the Methodology for determining hydromorphological indicators for watercourses in Romania (National Institute of Hydrology and Water

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
		proposed port of Glina, i.e. the diked area of the section occupying a small area in relation to the entire length of the water body, more precisely 3.2% of twice the length of the water body, thus being small in scale in terms of the effect in the plan of the variation in the bed profile.		Management, 2015), from the perspective of the proposed works, indicator 3.4 Morphology of the minor bed and its lateral mobility is analysed. The project works capable of having an effect on the indicator, i.e. unclogging to ensure navigational depth, are performed on a small area strictly at the level of the watercourse, i.e. 3.2% of twice the length of the water body. Due to the overall length of the development in relation to the overall length of the water body, we consider the impact of the proposed works on this indicator to be insignificant.
Morphological conditions: river bed structure and substrate	YES	The proposed works, which overlap with the existing water body, are expected to have an impact on the riverbed, but not on the structure and substrate of the riverbed, because by creating the navigable canal, only the depth and width of the river will be modified compared to the current situation, and any changes in the structure and substrate of the riverbed would only occur during the execution period.	YES	Since the navigable canal produces the deepening and the widening, respectively, of the river, from the point of view of the structure and substrate of the riverbed, the impact is expected to be only during the execution period, and on a reduced length compared to the double of the length of the water body, namely 3.2%, and the impact on the indicator is expected to be insignificant.
Morphological conditions: riparian zone structure	YES	The works at the port of Glina that may affect this indicator are specific works, consisting of the rehabilitation of the port. The port of Glina requires the following rehabilitation: the area of the port platform, the area intended for expansion, operational berths, passenger berths + tourist port, waiting areas, convoy assembly-disassembly areas. Due to this, the whole riparian zone is affected and considering the perspective of	YES	Due to the type of works, they occupy all the areas within the riparian zone, but on a reduced area of the water body, which is located on the left bank of the Dâmbovița river.

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
		the proposed works, the effect on the riparian zone structure will be temporary.		
Physical-chemical elements				
Oxygenation conditions	YES	Oxygenation conditions are only affected during the works. Basically, the decrease in oxygen is the indirect effect of the increase in turbidity.	YES	The effect will be insignificant for the entire water body.
Acidification	YES	Temporary effect, during the execution of works, caused by the machinery and equipment used.	YES	Insignificant effect due to the prevention measures foreseen.
Synthetic specific pollutants - organic micropollutants	YES	Temporary effect, during the execution of works, caused by the machinery and equipment used.	YES	Insignificant effect due to the prevention measures foreseen.
Quality biological elements				
Benthic invertebrate fauna	YES	The benthic invertebrate fauna in the riverbed will recover over time. The effect will be temporary due to the fact that the riverbed has the possibility of restoration over time, of renaturalisation. Once the works are completed, the invertebrate fauna will begin to recover.	YES	The navigable canal control works consisting of unclogging works are carried out along the river, the effect on the whole body of water in relation to its length is insignificant, with the element being restored over time.
Fish population	YES	The works foreseen by the project will not affect the biology or migration of species as the minor increase in the amplitude of water level fluctuations will only occur during the works.	YES	Considering that isolated working enclosures are created on the banks in order to build the navigable fairway, by means of the coffer dam, so that the water flow is not interrupted at any point, migration is unaffected, we believe that there is a negligible impact on this element.

Table no. 45 - Surface water body RORW10-1-25_B9 - Dâmbovița: upstream of the discharge Apa Nova (Glina) - conf. with Argeș river

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be temporary? Yes / No / Unsure	Justification	Will the effect be insignificant for the water body? Yes / No / Unsure	Justification
Hydromorphological elements				
Hydrological regime: flow quantity and dynamics	NO	By creating the navigable fairway and the hydrotechnical nodes, the quantity and dynamics of the flow in the water body is anthropized, in the sense that, when the vessels that are to use the respective section cross the fairway, the flow is modified on a case-by-case basis. In contrast, during the time when the fairway or the hydrotechnical nodes are not in use, the flow is normal and secured so as not to alter other environmental or hydromorphological factors.	NO	The manner of design of both the fairway and the hydrotechnical nodes at waterbody level means that, when ships are travelling on the current section, the amount and dynamics of the flow will change according to each individual requirement, but when the works are commissioned the changes in the amount and dynamics of the flow in relation to their normal values are major.
Longitudinal river continuity	NO	Due to the nature of the works at the hydrotechnical nodes, they may lead to the interruption of the longitudinal continuity of the river, the hydrotechnical nodes are equipped with: overflow weir with 3 openings and bottom discharge conduits, twin locks ensuring the transit of ships from one reach to another, power plant for processing the available hydropower potential and operational block section. But because there is a level difference in the area of the nodes, the impact is permanent, this difference being created by the completion of the nodes.	YES	On the longitudinal continuity indicator, we can foresee a possible impact due to the difference in level that occurs when creating the hydrotechnical nodes, but in order to maintain longitudinal continuity and to allow the migration of fish, the locks at the nodes will be open for 20 h per day, in order not to create a categorical damming of the water body.
Lateral river continuity	NO	With the proposed works, the floodplain's capacity to take over the floods is insignificantly reduced and the discharge is controlled due to the diversion. Therefore, the effect is temporary.	NO	The proposed new dams, the embankment elevations on the Dâmbovița River and the creation of the navigable canal are 29.9 km long, i.e. 46.7% of the length of the water body. In this respect the impact on the indicator is significant.
Morphological conditions: river depth and width	NO	By creating the navigable fairway, both the depth and width of the water body are altered	NO	In order to create the optimal navigation conditions calculated in the area of the

Under each heading, identify the quality indicator (parameter) that could be affected by the project	**Will the effect be <u>temporary</u>? Yes / No / Unsure**	**Justification**	**Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure**	**Justification**
		to allow ships to transit through the section from the level of the water body, thus the works are permanent in nature.		current section, the navigable fairway is to modify both the depth and the width of the water body depending on the site specifications, justified by the fact that, as the section has to be brought to a constant width and depth, the way in which to intervene is different, but at the end of the works the impact will be significant.
Morphological conditions: river bed structure and substrate	YES	The proposed works, which overlap with the existing water body, are expected to have an impact on the riverbed, but not on the structure and substrate of the riverbed, because by creating the navigable canal, only the depth and width of the river will be modified compared to the current situation, and any changes in the structure and substrate of the riverbed would only occur during the execution period.	YES	Since the navigable canal causes the deepening and widening of the river, in terms of the structure and substrate of the riverbed instead, the impact is expected to be manifested only during the execution period and not to generate a permanent impact on the indicator, thus, it is expected to be of an insignificant nature.
Morphological conditions: riparian zone structure	YES	The works that may impact the riparian zones on the project site are as follows: - Rehabilitation of the Cucuieți and Tanganu hydrotechnical nodes; - Construction of a new bridge over the county road DJ101 Cernica - Bălăceanca at approx. 25 m upstream from the existing bridge, which is to be demolished; - Construction of a new bridge over the county road DJ100 Fundeni - Pițigaia at approx. 25 m downstream from the existing bridge, which will be demolished; - Construction of a new bridge over the county road DJ412 Nuci - Vailați at approx. 250 m downstream from the existing bridge, which will be demolished;	YES	Due to the types of works, they occupy all areas within the riparian zone but only a small area of the water body. The effect will be insignificant for the entire water body.

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
		Due to this aspect the riparian zone in the area of the hydrotechnical node and the bridges is affected and taking into account the perspective of the proposed works, the effect on the riparian zone structure will be temporary. The types of works, by their nature, have a strictly temporary impact on the structure of the riparian zone in the area of the site in question during the execution period. Due to these issues the riparian zone is temporarily affected in the area of the proposed works site.		
Physical-chemical elements				
Oxygenation conditions	YES	Oxygenation conditions are only affected during the works. Basically, the decrease in oxygen is the indirect effect of the increase in turbidity.	YES	The effect will be insignificant for the entire water body.
Acidification	YES	Temporary effect, during the execution of works, caused by the machinery and equipment used.	YES	Insignificant effect due to the prevention measures foreseen.
Synthetic specific pollutants - organic micropollutants	YES	Temporary effect, during the execution of works, caused by the machinery and equipment used.	YES	Insignificant effect due to the prevention measures foreseen.
Quality biological elements				
Phytoplankton	YES	The effect on this indicator is for short periods of time, reduced in complexity, manifested only during the execution of works.	YES	Due to the measures adopted with regard to the technology of the works, the rapid spread of phytoplankton and the total length of the development in relation to the total length of the water body, we consider that the impact of the proposed works on this element is negligible, with recovery of the element over time.
Benthic invertebrate fauna	YES	The benthic invertebrate fauna in the riverbed	YES	Due to the measures adopted in terms of

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
		will recover over time. The effect will be temporary due to the fact that the riverbed has the possibility of restoration over time, of renaturalisation. Once the works are completed, the invertebrate fauna will begin to recover.		the technology of the works, the short period of time over which the distribution of benthic invertebrate fauna regenerates and the overall length of the development in relation to the total length of the water body, we consider that the impact of the proposed works on this element is insignificant.
Fish population	YES	The works foreseen by the project will not affect the biology or migration of species as the minor increase in the amplitude of water level fluctuations will only occur during the works.	YES	Considering that isolated working enclosures are created on the banks for the consolidation works, which are punctually placed by means of the embankment, so that the water flow is not interrupted at any point where works are carried out, and migration is not affected, we consider that there is a negligible impact on this element. Also, even if a level difference is proposed at the hydrotechnical nodes, in that their locks are to be open for 20h per day, this is in order not to interrupt the migration of fish fauna and not to create a permanent dam.

Table no. 46 - Surface water body RORW10-1_B7 - Argeș: section upstream of the confluence with the Dâmbovița river - confluence with the Danube

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be temporary? Yes / No / Unsure	Justification	Will the effect be insignificant for the water body? Yes / No / Unsure	Justification
Hydromorphological elements				
Hydrological regime: flow quantity and dynamics	NO	By creating the navigable fairway and the hydrotechnical nodes, the quantity and dynamics of the flow in the water body is anthropized, in the sense that, when the vessels that are to use the respective section cross the fairway, the flow is modified on a case-by-case basis. In contrast, during the time when the fairway or the hydrotechnical nodes are not in use, the flow is normal and secured so as not to alter other environmental or hydromorphological factors.	NO	The manner of design of both the fairway and the hydrotechnical nodes at waterbody level means that, when ships are travelling on the current section, the amount and dynamics of the flow will change according to each individual requirement, but when the works are commissioned the changes in the amount and dynamics of the flow in relation to their normal values are major.
Longitudinal river continuity	NO	Due to the nature of the works at the Oltenița hydrotechnical node, they may lead to the interruption of the longitudinal continuity of the river, as the hydrotechnical node is equipped with: overflow weir with 3 openings and bottom discharge conduits, twin locks ensuring the transit of ships from one reach to another, power plant for processing the available hydropower potential and operational block section. But because there is a level difference in the area of the nodes, the impact is permanent, this difference being created by the completion of the nodes.	YES	On the longitudinal continuity indicator, we can foresee a possible impact due to the difference in level that occurs when creating the hydrotechnical nodes, but in order to maintain longitudinal continuity and to allow the migration of fish, the locks at the nodes will be open for 20 h per day, in order not to create a categorical damming of the water body.

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
Lateral river continuity	YES	The effect of the cant and diking works on the capacity of the floodplain to withstand floods on the water body will be permanent and will be manifested during floods with a probability of exceedance for the designed situation. The effect on the indicator is strictly temporary during the execution of the works. These hydrotechnical works are designed to form barriers around settlements in order to protect against flooding during flash floods.	YES	The proposed new dams and embankment elevations on the Argeș River are 27.2 km in length, which is twice the length of the water body, i.e. 45.3%. In this respect the impact on the indicator is significant.
Morphological conditions: river depth and width	NO	By creating the navigable fairway, both the depth and width of the water body are altered to allow ships to transit through the section from the level of the water body, thus the works are permanent in nature.	NO	In order to create the optimal navigation conditions calculated in the area of the current section, the navigable fairway is to modify both the depth and the width of the water body depending on the site specifications, justified by the fact that, as the section has to be brought to a constant width and depth, the way in which to intervene is different, but at the end of the works the impact will be significant.
Morphological conditions: river bed structure and substrate	YES	The fairway improvement works consisting of unclogging works carried out in order to ensure navigational depth may locally disturb the structure and substrate of the riverbed. The effect is temporary during the period of execution of the works.	YES	The works are of a local character so that their effect on the structure and substrate of the bed at the water body level is insignificant. The granulometric composition undergoes changes strictly at the level of the riverbed where the unclogging will be carried out, with no impact propagating upstream/downstream.

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
Morphological conditions: riparian zone structure	YES	The rehabilitation works on the existing bridges and the works at the port of Oltenița that may affect this indicator are precise works. The port of Oltenița requires the following rehabilitation: the area of the port platform, the area intended for expansion, operational berths, passenger berths + tourist port, waiting areas, convoy assembly-disassembly areas and multifunctional building. Due to this, the whole riparian zone is affected and considering the perspective of the proposed works, the effect on the riparian zone structure will be temporary strictly during the period of works.	YES	Due to the type of works, they occupy all areas within the riparian zone but only a small area of the water body.
Physical-chemical elements				
Oxygenation conditions	YES	Oxygenation conditions are only affected during the works. Basically, the decrease in oxygen is the indirect effect of the increase in turbidity.	YES	The effect will be insignificant for the entire water body.
Acidification	YES	Temporary effect, during the execution of works, caused by the machinery and equipment used.	YES	The effect will be insignificant for the entire water body.
Synthetic specific pollutants - organic micropollutants	YES	Temporary effect, during the execution of works, caused by the machinery and equipment used.	YES	The effect will be insignificant for the entire water body.
Quality biological elements				
Phytoplankton	YES	The effect on this indicator is for short periods of time, reduced in complexity, manifested only during the execution of works.	YES	Due to the measures adopted with regard to the technology of the works, the rapid spread of phytoplankton and the total length of the development in relation to the total length of the water body, we consider that the impact of the proposed works on this element is negligible, with recovery of the element over

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
				time.
Phytobentos	YES	The effect on this indicator is for short periods of time, reduced in complexity, manifested only during the execution of works.	YES	Due to the measures adopted with regard to the technology of the works, the rapid spread of phytobenthos and the total length of the development in relation to the total length of the water body, we consider that the impact of the proposed works on this element is negligible, with recovery of the element over time.
Benthic invertebrate fauna	YES	The benthic invertebrate fauna in the riverbed will recover over time. The effect will be temporary due to the fact that the riverbed has the possibility of restoration over time, of renaturalisation. Once the works are completed, the invertebrate fauna will begin to recover.	YES	The slope reinforcement works are specific, the effect on the whole water body in relation to its length is insignificant, with the element being restored over time.
Fish population	YES	The works foreseen by the project will not affect the biology or migration of species as the minor increase in the amplitude of water level fluctuations will only occur during the works.	YES	Considering that isolated working enclosures are created on the banks for the consolidation works, which are punctually placed by means of the embankment, so that the water flow is not interrupted at any point where works are carried out, and migration is not affected, we consider that there is a negligible impact on this element. Also, even if a level difference is proposed at the hydrotechnical nodes, in that their locks are to be open for 20h per day, this is in order not to interrupt the migration of fish fauna and not to create a permanent dam.

Table no. 47 - Surface water body RORW10-1_B6 - Argeș: sector downstream of the Mihăilești reservoir - upstream of the confluence with the Dâmbovița river

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be temporary? Yes / No / Unsure	Justification	Will the effect be insignificant for the water body? Yes / No / Unsure	Justification
Hydromorphological elements				
Hydrological regime: flow quantity and dynamics	NO	By creating the navigable fairway and the hydrotechnical nodes, the quantity and dynamics of the flow in the water body is anthropized, in the sense that, when the vessels that are to use the respective section cross the fairway, the flow is modified on a case-by-case basis. In contrast, during the time when the fairway or the hydrotechnical nodes are not in use, the flow is normal and secured so as not to alter other environmental or hydromorphological factors.	NO	The manner of design of both the fairway and the hydrotechnical nodes at waterbody level means that, when ships are travelling on the current section, the amount and dynamics of the flow will change according to each individual requirement, but when the works are commissioned the changes in the amount and dynamics of the flow in relation to their normal values are major.
Longitudinal river continuity	NO	Due to the nature of the works at the hydrotechnical nodes, HN of Budești, HN of Copăceni and HN of Colibași, this may lead to the interruption of the longitudinal continuity of the river, as the nodes are equipped with: spillway dam with 2 and 3 openings and bottom discharge conduits, twinned locks that ensure the transit of vessels from one reach to another, power plant for processing the available hydropower potential and operational block section. But because there is a level difference in the area of the nodes, the impact is permanent, this difference being created by the completion of the nodes.	YES	On the longitudinal continuity indicator, we can foresee a possible impact due to the difference in level that occurs when creating the hydrotechnical nodes, but in order to maintain longitudinal continuity and to allow the migration of fish, the locks at the nodes will be open for 20 h per day, in order not to create a categorical damming of the water body.
Lateral river continuity	YES	The effect of the cant and diking works on the capacity of the floodplain to withstand floods on the water body will be permanent	YES	The proposed new dams and embankment elevations on the Dâmbovița River are 54.8 km long, which is twice the length of the water

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
		and will be manifested during floods with a probability of exceedance for the designed situation. The effect on the indicator is strictly temporary during the execution of the works. These hydrotechnical works are designed to form barriers around settlements in order to protect against flooding during flash floods.		body of 114 km, i.e. 40.3%. In this respect the impact on the indicator is significant.
Morphological conditions: river depth and width	YES	The effect of the works within the project, the development of the navigable fairway, the works within the framework of the rehabilitation of the hydrotechnical nodes and the port of 1 Decembrie-Bucharest and the works at the dams are permanent. The effect on the indicator is strictly temporary during the execution of the works.	YES	In order to evaluate the status of this indicator according to the Methodology for determining hydromorphological indicators for watercourses in Romania (National Institute of Hydrology and Water Management, 2015), from the perspective of the proposed works, indicator 3.4 Morphology of the minor bed and its lateral mobility is analysed. The fairway development works, the works at the port and at the hydrotechnical node and the works at the dams are not considered to significantly change the morphology of the riverbed and the lateral mobility. The effect is insignificant for the water body.
Morphological conditions: river bed structure and substrate	YES	The fairway improvement works consisting of unclogging works carried out in order to ensure navigational depth may locally disturb the structure and substrate of the riverbed. The effect is temporary during the period of execution of the works.	YES	The works are of a local character so that their effect on the structure and substrate of the bed at the water body level is insignificant. The granulometric composition undergoes changes strictly at the level of the riverbed where the unclogging will be carried out, with no impact propagating upstream/downstream.

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
Morphological conditions: riparian zone structure	YES	The rehabilitation works on the existing bridges and the works at the port of 1 Decembrie-Bucharest that may affect this indicator are precise works. The Port of 1 Decembrie-Bucharest requires the following rehabilitation: the area of the port platform, the area intended for expansion, operational berths, passenger berths + tourist port, waiting areas, convoy assembly-disassembly areas and multifunctional building. Due to this, the whole riparian zone is affected and considering the perspective of the proposed works, the effect on the riparian zone structure will be temporary.	YES	Due to the type of works, they occupy all areas within the riparian zone but only a small area of the water body.
Physical-chemical elements				
Oxygenation conditions	YES	Oxygenation conditions are only affected during the works. Basically, the decrease in oxygen is the indirect effect of the increase in turbidity.	YES	The effect will be insignificant for the entire water body.
Acidification	YES	Temporary effect, during the execution of works, caused by the machinery and equipment used.	YES	The effect will be insignificant for the entire water body.
Synthetic specific pollutants - organic micropollutants	YES	Temporary effect, during the execution of works, caused by the machinery and equipment used.	YES	The effect will be insignificant for the entire water body.
Quality biological elements				
Phytoplankton	YES	The effect on this indicator is for short periods of time, reduced in complexity, manifested only during the execution of works.	YES	Due to the measures adopted with regard to the technology of the works, the rapid spread of phytoplankton and the total length of the development in relation to the total length of the water body, we consider that the impact of the proposed works on this element is negligible, with recovery of the element over

Under each heading, identify the quality indicator (parameter) that could be affected by the project	Will the effect be <u>temporary</u>? Yes / No / Unsure	Justification	Will the effect be <u>insignificant</u> for the water body? Yes / No / Unsure	Justification
				time.
Benthic invertebrate fauna	YES	The benthic invertebrate fauna in the riverbed will recover over time. The effect will be temporary due to the fact that the riverbed has the possibility of restoration over time, of renaturalisation. Once the works are completed, the invertebrate fauna will begin to recover.	YES	The navigable canal control works consisting of unclogging works are carried out along the river, the effect on the whole body of water in relation to its length is insignificant, with the element being restored over time.
Fish population	YES	The works foreseen by the project will not affect the biology or migration of species as the minor increase in the amplitude of water level fluctuations will only occur during the works.	YES	Considering that isolated working enclosures are created on the banks for the consolidation works, which are punctually placed by means of the embankment, so that the water flow is not interrupted at any point where works are carried out, and migration is not affected, we consider that there is a negligible impact on this element. Also, even if a level difference is proposed at the hydrotechnical nodes, in that their locks are to be open for 20h per day, this is in order not to interrupt the migration of fish fauna and not to create a permanent dam.

It should be mentioned that, according to the *Argeș - Vedea River Basin Management Plan*, the justifications of the exceptions applied to surface water bodies are applied to the above-mentioned water bodies, such as:

River basin / hydrographic area	Argeș - Vedea
Water body	**Argeș - sector upstream of the confluence with the Dâmbovița river - Danube**
Water body type and code	RO11*CAPM, RORW10-1_B7
Protected area	Protected areas for aquatic species - GEO 57/2007
Significant pressure	1.1 - point-like - urban waste water 8 - unknown pressures
Ecological status / ecological potential	Moderate ecological potential
Environmental objective and timeframe for achieving the	Good ecological potential / After 2027

River basin / hydrographic area	Argeș - Vedea
environmental objective	
Exception type	Art. 4.4.c of the WFD
Sub - exception type	Natural conditions
Measures progressively leading the water body towards the environmental objective	Basic measures to ensure compliance with the requirements of Directive 91/271/EEC on urban waste water treatment for agglomerations of more than 10000 p.e.: Bucharest (Completion of the Glina wastewater treatment plant - SE capacity extension and rehabilitation of the main sewerage collectors - phase IIa, with planned completion date 2023, and Rehabilitation of the main sewerage collectors and the Dâmbovița collector channel - box in Bucharest, with completion after 2027)
Deadline for implementation of the measure	After 2027
Chemical status	**Does not reach a good chemical status**
Environmental objective and timeframe for achieving the environmental objective	**Good chemical status:** after 2027, for: - Mercury - Brominated diphenylethers - Heptachlor and Heptaclorepoxide
Exception type	**Art. 4.4.c of the WFD**
Sub - exception type	**Natural conditions**
Measures to achieve the environmental objective	Brominated diphenyl ethers and mercury are persistent, poorly degradable substances in the environment with the specificity of accumulation in biota and/or sediments and continuous release to water bodies. Because of these properties and conditions, the level of concentrations in these matrices is expected to decrease very slowly and the environmental quality standards are expected to be achieved within decades, despite significantly reduced emissions to the environment.
Deadline for implementation of the measure	Starting 2022 and continuing after 2026.

River basin / hydrographic area	Argeș - Vedea
Water body	**Dâmbovița : upstream of the discharge Apa Nova (Glina) - confl. Argeș river**
Water body type and code	RO10*CAPM, RORW10-1-25_B9
Protected area	-
Significant pressure	1.1 - Point-like - Urban waste water 2.6 - Diffuse - Discharges not connected to the sewerage system

River basin / hydrographic area	Argeș - Vedea
	2.2 - Diffuse - Agriculture
Ecological status / ecological potential	Moderate ecological potential
Environmental objective and timeframe for achieving the environmental objective	Good ecological potential / After 2027
Exception type	Art. 4.4.c WFD Art. 4.4. WFD
Sub - exception type	Natural conditions Technical feasibility
Measures progressively leading the water body towards the environmental objective	- Basic measures to ensure compliance with the requirements of Directive 91/271/EEC on urban waste water treatment, with planned date of completion of the measure after 2027, for an agglomeration greater than 10000 p.e.: Bucharest (Completion of the Glina wastewater treatment plant - SE capacity extension and rehabilitation of the main sewerage collectors - phase IIa, with planned completion date 2023, and Rehabilitation of the main sewerage collectors and the Dâmbovița collector channel - box in Bucharest, with completion after 2027); - Basic measures to ensure compliance with the requirements of Directive 91/271/EEC on urban wastewater treatment, with planned date of completion of the measure in 2026, of the type Construction of sewerage network and treatment plant / Extension of sewerage network / Sludge management, in an agglomeration under 2000 p.e. (Căldăraru), in 6 agglomerations between 2.000 - 10000 p.e.: Vasilaţi, Fundeni, Plătăreşti, Cățelu, Cernica, Gălbinași, and 3 agglomerations above 10000 p.e. (Popeşti Leordeni, Pantelimon, Voluntari); - Basic measures to ensure compliance with the requirements of Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources for 7 agglomerations, with a planned date of completion of the measure in 2026: o Developing Local Action Plans o Storage of manure in individual storage facilities; o Creation of buffer strips; o Organising training sessions at local level
Deadline for implementation of the measure	2022-2026, after 2027, respectively
Chemical status	Good chemical status
Environmental objective and timeframe for achieving the	Good/2016-2021

River basin / hydrographic area	Argeș - Vedea
environmental objective	
Exception type	-
Sub - exception type	-
Measures to achieve the environmental objective	-
Deadline for implementation of the measure	-

River basin / hydrographic area	Argeș - Vedea
Water body	**Argeș: section downstream of Mihăilești - upstream of the confluence with the Dâmbovița river**
Water body type and code	RO10*CAPM, RORW10-1_B6
Protected area	-
Significant pressure	8 - Unknown pressures
Ecological status / ecological potential	Good ecological potential
Environmental objective and timeframe for achieving the environmental objective	Good ecological potential / 2016-2021
Exception type	-
Sub - exception type	-
Measures progressively leading the water body towards the environmental objective	-
Deadline for implementation of the measure	-
Chemical status	Does not reach a good chemical status
Environmental objective and timeframe for achieving the environmental objective	Good chemical status: after 2027, for: - Mercury - Brominated diphenylethers - Heptachlor and Heptaclorepoxide
Exception type	Art. 4.4.c WFD
Sub - exception type	Natural conditions
Measures to achieve the environmental objective	Brominated diphenyl ethers and mercury are persistent, poorly degradable substances in the environment with the specificity of accumulation in biota and/or sediments and continuous release to water bodies. Because of these properties and conditions, the level of concentrations in these matrices is expected to decrease very slowly and the environmental quality standards are

River basin / hydrographic area	Argeș - Vedea
	expected to be achieved within decades, despite significantly reduced emissions to the environment.
Deadline for implementation of the measure	Starting 2022 and continuing after 2026.

River basin / hydrographic area	Argeș - Vedea
Water body	**Dâmbovița: downstream of Morii Lake - upstream of the discharge Apa Nova (Glina)**
Water body type and code	RO10*CAPM / RORW10-1-25_B8
Protected area	-
Significant pressure	4.1.1 - Physical alterations of channels, riverbed and riparian structure
Ecological status / ecological potential	Moderate ecological potential
Environmental objective and timeframe for achieving the environmental objective	2027
Exception type	Art. 4.5 of the WFD
Sub - exception type	Technical feasibility
Measures progressively leading the water body towards the environmental objective	Technical feasibility It is part of the complex development of the Dâmbovița river, together with the Lacul Morii reservoir (Hdam = 19 m) located upstream. It is a regularised section of the river, through the construction of a concrete canal (clean water collector located at pavement level) with reaches and hydrotechnical nodes, above the collectors where the domestic and industrial wastewater of the municipality of Bucharest is discharged, with the role of flood defences, the transit of the entire range of flows discharged from Morii Lake, planning, urbanisation, recreation and sanitation. Diversification of bank, riverbed and habitat structure (renaturation of the riverbed) was believed to have negative impacts - possible problems with sanitisation and water purification, given the small slope of the water flow. There is no physical space to create wetlands with a defence role, as this zone crosses Bucharest. Given the technical characteristics of the dam and downstream development, the renaturation of this water body is technically not feasible.
Chemical status	Good chemical status
Environmental objective and timeframe for achieving the environmental objective	Good chemical status / 2016 - 2021
Exception type	-
Sub - exception type	-
Measures to achieve the environmental objective	-
Deadline for implementation of the measure	-

6.6.1.2 Sources of water pollution

6.6.1.2.1 Construction period

6.6.1.2.1.1 <u>Influence of works during construction with impact on water sources</u>

❖ Point (stationary) sources

Discharges of household wastewater containing faeces associated with site organisations (including borrow pits, quarries and work establishments) are a main source.

The following locations have been proposed for the site organisations:

- km 0 – km 28+032 (reach 0-1)
- km 28+032 - km 53+635 (reach 2)
- km 53 +635 – km 83
- Port of Oltenița
- Port of 1 Decembrie
- Port of Glina
- In the area of hydrotechnical nodes.

❖ Diffuse sources of pollution

Diffuse sources of pollution include:

- intermediate (bulk) stockpiles of construction materials (especially powdery materials) that may be washed away by stormwater, with the particles being washed onto adjacent land.
- washing the machinery (dumper trucks, lorries, etc.)
- works in minor or major watercourses.

The impact on water during construction can be summarised as follows:

Types of impact	Effects
Physical impact on surface water and groundwater	- altering the water regime by diverting watercourses - increased water turbulence in the area of bank protection works - increased water turbulence in the area of bank protection works - temporarily changing the river bed in the area of bridges - obstacles to the free flow of water as a result of works at the riverbed
Impact on groundwater and surface water quality	- consequences of accidental pollution by hydrocarbons or other toxic substances - consequences of discharges of untreated or insufficiently treated wastewater or contaminated stormwater

River bed intervention works intended to allow the execution of the works are the works that most affect the watercourse by increasing turbidity when removing material from the river bed. Increased water alkalinity may occur as a result of loss of construction materials to water during commissioning. It is recommended that the work is carried out in such a way that the loss of material (cement mortar in particular) is minimised. It should be noted that most of the materials used are natural materials, so there is no danger of infestation with foreign substances. Moreover, the contractor is obliged to remove any remaining material from the riverbed when the works are finished.

Disturbance of the aquatic soil leads to a sudden increase in the concentration of suspended solids in the water body, with their dispersion and settling being delayed by the existence of currents or disturbance factors that greatly slow down these processes.

More material in suspension for a longer period of time, as a result of repeated action on the bottom, can prevent light penetrating to the depth. Lack of solar radiation affects the photosynthesis process of aquatic organisms.

Suspended particles can be returned to the riverbed bottom either by gravitational deposition (settling) or by choosing a different deposition site due to their mobility.

Organics in the suspended material can absorb available oxygen from the surrounding waters and can create locally unsuitable living conditions for many aquatic animals.

Sediment disturbance also involves the potential release of toxic compounds back into solution, which can contaminate or kill important fish stocks.

It is believed that the impact of ballast mining on water bodies cannot be totally avoided but can be minimised by the proposed measures. This impact only manifests itself during the works. It can occur even after the works are finished if large and deep potholes remain in the riverbed.

The impact on water should also be seen in terms of increased turbidity of water in the area of the works with the effects already described. These impacts are short-lived and only occur during the construction period.

Works on river banks can lead to the destruction of biotopes and a migration of ichthyofauna to less favourable areas.

As the area over which the works are being carried out is quite large, it is recommended to minimise the execution time and to execute the works with maximum efficiency in order to reduce the impact of the works over time.

Platforms for the storage of materials (aggregates, cement, binders, and other types of materials) should be enclosed or covered and provided with perimeter trenches, so that there is no danger of fine particles being blown into the atmosphere and deposited on the ground and in the water, blown away during periods of high wind intensity. This eliminates the risk of these particles reaching into groundwater via rainwater, or into river water.

Proper maintenance of machinery and performing oil changes at special oil and grease change stations as oils and greases are highly polluting.

Fuels and chemicals must be stored in sealed containers.

For works to be carried out on land, organisational measures are the only way to minimise the impact of these works on surface waters.

Discharge of domestic wastewater or polluted stormwater directly into watercourses or onto the ground leads to increased pollution of surface or groundwater with effects on the aquatic system.

The table below summarises the effects on the aquatic environment and human health of the various pollutants contained in untreated or insufficiently treated waste water.

Pollutant	Effects
Particulate matter	Particulate matter can lead to mud deposits and anaerobic conditions when wastewater is discharged unpurified into the environment
Biodegradable organic compounds	Composed mainly of proteins, carbohydrates and fats, biodegradable organic compounds are determined and expressed in terms of Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). If discharged unpurified into the environment, their biological stabilisation can lead to depletion of natural oxygen resources and the development of septic conditions
Pathogens	Pathogens in wastewater can transmit contagious diseases
Nutrients	Both nitrogen and phosphorus, along with carbon, are the main nutrients for growth. When released into the environment, they can cause undesirable amplification of aquatic life. When released in very large quantities on land, they can also lead to groundwater pollution.
Priority pollutants	Organic and inorganic compounds selected on the basis of known or suspected carcinogenic, mutagenic or teratogenic properties, or on the basis of high toxicity. Many of these compounds are present in wastewater
Refractory organic	These organic compounds tend to resist conventional wastewater

Pollutant	Effects
compounds	treatment methods. Typical examples include surfactants, phenols and agricultural pesticides
Heavy metals	Heavy metals are usually added to wastewater as a result of commercial or industrial activities and may need to be removed if treated water is to be reused
Dissolved inorganic compounds	Inorganic constituents, such as calcium, sodium and sulphate, occur in domestic water as a result of household activities and may need to be removed if the water is to be reused

The reaches of the hydrotechnical nodes of Cucuieti, Budești, Tânganu **need greening works** in the existing Dâmbovita riverbed. The infested material, excavated from the Dâmbovița riverbed, will be deposited in geotubes in specially arranged waste dumps. The average height of the layer of infested material on the two reaches is approx. 1.00 m.

The reach of the HN of Glina - HN of Tânganu **requires greening works** along its entire length. Due to the failure of the Bucharest sewage treatment system, downstream of Glina, the riverbed has undergone an intense process of clogging. The average height of the layer of infested material is approx. 1.50 m. The infested material excavated from the Dâmbovita riverbed will be deposited in geotubes in specially arranged waste dumps.. The volume of material excavated from the Dâmbovita riverbed on the three reaches is estimated to be about 9.000.00 hundred cubic metres in both variants.

6.6.1.2.1.2 <u>The technology used for the greening works to be performed</u>

- the arrangement of the dump where the excavated material will be deposited by excavations and a closure embankment:
  - the realisation of the sealing system for the dump made of the following elements
    - geocomposite with bentonite inserts to seal the dump;
    - 1.5 mm thick high-density polythene geomembrane - to seal the dump
    - 30 cm gravel drainage layer
  - realisation of the drainage system in Dn 600 ribbed pipes protected with geotextile
- excavation of infested material with an excavator from pontoons;
- transporting the material to a sorting plant to remove coarse material;
- treatment of the material with flocculant to remove metals; every 5 km a composition test will be carried out on the excavated material to determine the amount of flocculant required to treat it;
- pumping the resulting material to the dump prepared and depositing this material in geotubes;
- after all the material has been deposited in the dump in geotubes, a layer of topsoil will be deposited on top of the geotubes to even out the surface, over which a geomembrane will be placed to seal the pit;
- on top of this geomembrane, a 50 cm layer of vegetation will be placed, which will be planted with grass in order to bring the dump back into the circuit.

6.6.1.2.1.3 <u>Dredging and filling works and storage of dredged material</u>

❖ **Dispersion and clearing of suspended sediments**

Sediment displacement can cause a range of environmental impacts. Problems occur particularly where sediments have been contaminated with chemicals, petroleum hydrocarbons and household waste.

Toxic or contaminating substances resulting from soil disturbance may be present in solution or suspension and may contaminate or cause mortality of ichthyofauna.

The particulate matter can be relocated to the bottom of the river bed either by natural deposition or by choosing another deposition site (the matter is sufficiently mobile).

Organics in suspended material can absorb available oxygen from the surrounding waters and temporarily create unsuitable living conditions for many aquatic animals.

If suspended sediments are present in high concentration and persist through extended operations, then it can decrease the light intensity in the water and thus affect the photosynthesis processes specific to aquatic organisms.

Sediments are in a suspended state during excavation and transfer to onshore or barge storage sites when dredging (suction/backwater) or scoop dredging equipment is used. Hydraulic dredging can reduce suspended material at the dredging site.

Before the works begin, knowledge of the hydrographic characteristics of the area (related to the river flow) is essential to identify those areas that would be affected by the works. Excavation of the riverbed bottom by dredging results in the removal of specific habitat for bottom-dwelling lifeforms. If there is an appreciable amount of sediment, the new sediment layer will form and restore the habitat after the works are completed.

As regards the excavations to be carried out, it should be noted that, especially on the course of the Dâmbovița river, but also on the Argeș river in the section between Budești and the Danube, the untreated waters of the capital have deposited, over time, significant quantities of impurities. Excavated material from infested areas will be deposited in specially arranged and greened landfills.

- **The impact of a bathymetric change**

Depending on the construction characteristics of canals, mooring places or berths, changes in the hydrological characteristics of the watercourse may occur. These features should highlight high water flows, swirling movements, etc. Hydrological and hydraulic modelling studies can be used to find ways to avoid undesirable situations. These situations can range from working the vessels in unsafe conditions to the need for frequent dredging or disturbance of fish stocks. Depending on the characteristics of the watercourse, impermissible changes in quality characteristics may also occur.

6.6.1.2.1.4 Impacts from the construction of quays, dykes and other similar structures

Pile-supported trestles make an impact in terms of the place where they are and in the neighbourhood. The presence of piles slows down the flow of the watercourse and may therefore increase the possibility of sediment deposition under the platform. Depending on local conditions, the downward trend in water levels may extend to areas close to navigation, requiring more frequent dredging operations. Neighbouring areas may be affected due to the increased intensity of forced flushing by water.

River bed intervention works intended to allow the execution of the works are the works that most affect the watercourse by increasing turbidity when removing material from the river bed. The works may also lead to increased alkalinity due to loss of materials in the water during commissioning. It is recommended that the work is carried out in such a way that the loss of material (cement mortar in particular) is minimised. It should be noted that most of the materials used are natural materials, so there is no danger of infestation with foreign substances. Even in this context the contractor is obliged to remove any remaining material from the riverbed upon the completion of the works. Sources of pollution during the construction period impacting on water resources may be classified as follows:

- point (stationary) sources;
- diffuse sources of pollution.

As there is no possibility to dispose of domestic wastewater containing faecal sludge in a sewerage system, the use of retention toilets is required. They will only be discharged into a sewerage system. This water must fulfil the conditions for discharge into the sewerage system, namely those laid down in NTPA 002/2005.

Diffuse sources of pollution are intermediate (bulk) stockpiles of construction materials (in particular dust-generating ones). These can be washed away by rainwater, with fine particles being washed into the water. It is therefore recommended that storage platforms be designed in such a way that there is no danger of spreading into the atmosphere and depositing on the ground or reaching water bodies.

The hydrotechnical works proposed in this project aim to:

- reduce the risk of destructive water action on bridges, ports and banks;
- stabilise the river bed by works intended to stop erosion.

The technologies for carrying out the works do not include disruption to the existing life and environment.

The constructive solutions adopted are in line with the natural specificities, without affecting or disturbing the existing organisation of the territory.

The contractor has the obligation to respect the dimensions laid down in the project; any modification thereof requires the designer's approval.

In order to adopt efficient solutions for the regulation of the lower course of the Argeș River, extensive studies were carried out to determine maximum and minimum water levels under natural conditions and under the modified regime resulting from the impoundment of the Argeș River. The flow velocities calculated for the modified regime, involving embankment and impoundment, under high discharge conditions on the Argeș River, are on the order of 2 to 2.5 m/s, depending on the canal width. These velocities necessitate the implementation of bank protection and stabilization measures.

Hydraulic studies and researches on experimental models were also carried out for the hydraulic works in the hydrotechnical nodes of the canal, and the obtained data were used for the dimensioning of the surface spillways, twinned locks and bottom discharge conduits, as they are involved in the transit of the design floods on the Argeș river.

The studies carried out show that it is necessary to continue the hydraulic laboratory tests on models in order to specify the operating conditions of the tainer gates, in the situation of aeration of the spillway line and dissipation of the energy of the water discharged through the locks, so that the protection measures in the downstream waiting ports can be specified, in particular at HN1 and HN2.

6.6.1.2.1.5 Impact of leakages from raw material storage facilities

When determining the environmental impact of these storage facilities due to outdoor exposure and climatic conditions, the duration of exposure, nature of the material, weather conditions, precipitation, persistence and direction of wind, exposure to sunlight and handling procedures should be taken into account.

The identification of impacts should include plans for the control of all leaks from the stored material and adjacent areas (dams, sewerage networks, and perhaps retention/evaporation/neutralisation ponds), provisions for the protection of workers handling the material, measures to prevent seepage into groundwater (waterproofing of the bottom of the storage facility is required) and control of drainage to adjacent port waters.

6.6.1.2.1.6 Stormwater impacts

The range of pollutants that can enter port waters from stormwater is very wide – the possibilities set out for raw material storage in point c) are suggestive. Although the main constituents consist of oils, diesel, petrol and hydraulic oils - the latter being the most common and possibly the only contributors by volume, other pollutants such as de-icing agents, substances resulting from accidental spills, should also be considered.

The pollutants present in stormwater run-offs collected from the port platform will be grouped into three categories, irrespective of form and origin, as follows:

- insoluble substances, which settle to the bottom of emissaries
- soluble substances that affect water quality and aesthetic value
- substances resulting from accidental spills, which have a high degree of concentration, with a focus on hydrocarbons.

This categorisation allows for more effective actions to tackle pollution.

As far as possible, the channelling of water from embankment defences, quays and areas adjacent to them directly into port waters should be avoided. Surfaces should have pavements and slopes to direct runoff to drainage basins - not over the edge of quays. The systems of drainage basins should be either clogged (requiring periodic pumping-out works) or connected to collection systems that direct the runoff to a central location where separation of the oils from the water can be done. The treated water can then be discharged into the port basin if it is within the standard discharge limits for the pollutant concentrations contained.

6.6.1.2.2 Operation period

6.6.1.2.2.1 Modification of alluvium transport regime

During the operational period, an alluvium transport process will develop in the canal bed, in which the solid material naturally present in the bed will also participate, depending on the hydraulic regime of the liquid phase imposed by the needs of the shipping traffic and the transit of the flood flows.

The alluvium in the canal bed will be subjected to the hydrodynamic entrainment of the liquid phase in varying flow regimes, both in the bed and in the water body.

The operation of the upstream cascade of reservoirs on the Argeș river and the construction (1994) of the Adunații reservoir at average hydraulic parameters has the effect of retaining part of the natural alluvium input of the Argeș river of approx. 88%.

The alluvium sources that remain active along the Canal's route are the main tributaries with an estimated multiannual average input of:

- approx. 0.03 million tonnes/year for the Sabar and Ciorogârla rivers;
- approx. 0.02 million tonnes/year for the Neajlov river (after the construction of the Comana lake);
- approx. 0.015 million tonnes/year for the rivers Cocioc, Câlnau, Pasarea, Rasa, Luica, Mitreni.

These volumes of alluvium flowing into the Canal bed will be supplemented by larger volumes of alluvium material from the deformable bed of the navigable reaches course.

In the current developed regime, the solid flow increases due to bed erosion and gravel pits, thus there is an increase from 0.25 million tonnes/year downstream Golești reservoir to 0.54 million tonnes/year - hydrographic area Malu Spart and up to 0,92 mil.t/year - hydrographic area Budești.

The main effects of alluvial transport on the bed of the Lower Argeș river and related hydrotechnical structures are:

- general alluvium siltation of the fairway with the development of alluvium deposits in the form of sandbanks;
- alluvium siltation of the sections upstream of hydrotechnical nodes and chambers of the navigation locks;
- local upstream siltation of confluence areas;
- erosional degradation of sections of riverbed downstream of hydrotechnical nodes;
- the decrease over time of the capacity of the floods to pass through the canal;
- difficulties in ensuring the operation of some of the equipment of the hydrotechnical nodes.

In addition to the effects of multiannual average siltation, there are the effects that occur during the transit of major floods when alluvial processes are much more intense and when the rate of siltation can increase greatly.

The Adunații Reservoir is the only component that has operated in recent years in a regime relatively close to the normal operating regime of the proposed Navigable Canal on the Lower Argeș River.

6.6.1.2.2.2 Impact of discharges of ship-generated waste

Waste water and household waste, whether discharged from ships or from land, are a major source of pollution in ports. The legislative and administrative measures adopted, which prohibit the discharge of waste water or household waste into port waters, must be backed up by the provision of appropriate

facilities for the collection of such waste.

A major source of pollution in ports is ballast water and bilge water from ships. The implementation of MARPOL 73/78 imposes limits on the oil content when taking over bilge water. This limit is up to 15 parts in a million.

In order to determine the capacity and type of facilities required in the port, a number of parameters have to be taken into account, such as: the design vessel, type of propulsion, navigation routes, including existing facilities in the ports from which the ships arrive.

A number of ports operating oil tankers are equipped with facilities to take ballast water and water from tank washings and treat the resulting mixture to separate the oil from the water. The treated water must contain less than 15 ppm oil when discharged into the port basin water. Several port authorities now require that the oil-water mixture be less than 5 ppm.

The collection and treatment of wastewater from machinery is not a very large amount, but its disposal poses a number of problems. Oil residues from the cleaning of oil tankers entail disposal problems.

Small vessels such as tug boats, pilotage vessels are generally not equipped with bilge water separation and filtration systems. It will analyse how port authorities provide adequate facilities for taking over this water from ships.

It is necessary to provide floating sewage and garbage facilities for ships waiting to dock.

6.6.1.2.2.3 The impact of spills from ships

Losses due to spills from ships can be prevented through a series of regulations backed up by enforcement programmes and the provision of appropriate facilities for taking over the waste from ships. Accidental spills can occur due to collision, fire, etc., as a result of equipment failure (burst pipes) or improper operating procedures during cargo handling or bunkering. Such spills may involve substances such as crude oil, refined products or oil residues, toxic liquid substances and hazardous substances in packaged form.

Volatile oils in general are less dangerous because they evaporate quickly into the atmosphere, but they are more likely to cause explosions. Viscous substances remain on the water's surface, moving compactly with the direction of currents and wind. Chemical spills can contaminate water with toxic substances that can have a dangerous effect on marine organisms.

Petroleum and chemical operating facilities should be located as far away as possible from sensitive areas such as farm fish projects and beaches. When planning pollution prevention operations, these areas are a priority.

6.6.1.2.2.4 The impact of non-sanitary waste spills, other than those from ships Anti-fouling paint

In addition to the industrial spills that occur on a regular basis, particular attention must be paid to accidental spills that may occur. One such accident concerns oil leaks due to improper operation of mechanical installations. Although the volume of these leaks is minor, however, where the installations are outdated, the frequency of these leaks can be higher and can become a major cause of pollution of the port basin. This factor needs to be estimated and measures need to be put in place to reduce their frequency in conjunction with routine emergency response actions.

By its nature, anti-fouling paint is hostile to aquatic life. It protects against the attachment of specific sealife to the hull of ships, causing them to be removed and die.

Careless paint application can lead to increased concentrations in the water and marine life can be seriously endangered. Particular attention should be paid to where vessels are due to be repaired. In certain situations, removing the old paint and applying a new coat can lead to hazardous substances leaking into the water. Major damage is likely to be caused on underwater surfaces (where organisms are found) such as floating docks and where debris from paint removal is collected. Because of its potential to poison the environment, the use of this type of paint is regulated or banned in many

countries, particularly where ships dock or anchor and where depths are shallow.

6.6.1.3 Sources of pollutants during decommissioning

During the decommissioning period, the main sources of water pollution are similar to those during the execution period, but depend on the area to be decommissioned, the location of the decommissioned site and especially on the related activities that will be taking place at that time in the neighbouring areas.

6.6.1.4 Impact assessment on downstream water bodies (receptor)

The project is located on the Argeș river, upstream of the Danube river, and the confluence area is in the area of the port of Oltenița.

During the execution period, given that the works will be carried out gradually, according to a phasing schedule, in compliance with the measures in this report and those in the Water Rights Permit, the impact felt as a result of the demolition, construction, dredging, etc. works (as they were foreseen in the project) **will generate a moderate negative impact** in the confluence area between the Argeș River and the Danube River.

A critical period is the low-water (drought) period when water levels on both inland rivers and the Danube will be low. During this period any accidental spillage of products/chemicals can be felt both on the fauna/flora in water bodies and on the water quality (changing the quality of the water bodies from which it was incidentally generated).

For these periods, when the water level is low, during the operational period (by responsibility of the direct beneficiary and the port and naval operators), action plans will be implemented with the necessary measures.

Moreover, during periods of heavy rainfall, when the water level (both on inland rivers and on the Danube River) will be increased, there is a danger of an impact on the quality of water bodies with an effect on both physico-chemical indicators and ecological indicators / biodiversity in water bodies. For these periods, the contractor will implement action plans and operational plans to prevent and minimise environmental incidents and accidental pollution.

At the time of drafting the environmental impact assessment report, in the confluence area between the Argeș River and the Danube River, there are no known projects approved / in the process of being approved that would generate a cumulative impact.

Downstream or upstream of the confluence area, on the Danube river, there may be other projects (proposed in the process of authorisation / in operation), such as *"Restoration and renaturation of the Bala branch bifurcation area for ensuring navigation and environmental protection conditions on the Danube within the project "Improvement of navigation conditions on the Danube between Călărași and Braila, km 375 - km 175",* but the site is at a distance from the area of interest. The project is located in Călărași County, on the Bala branch of the Danube, approximately 55 km downstream of the project area subject to the present environmental impact assessment.

We reiterate that the works proposed for the port of Oltenița are works with an opening towards the Argeș river, so any incident that could create an impact on the surface water body, up to the area of the second project (the works on the Bala branch mentioned above), will generate a negligible negative impact at a distance of about 55 km downstream on the Danube river.

6.6.1.1 Sensitivity class

The works that are the object of this study are located within and/or outside the built-up area of the TAUs of the three counties intersected, as specified in the previous chapters and as can be seen from the attached plans.

Based on the analysis of the current state of the environment (presented in chapter 4 of this report) in the area of influence of the project, the quality status of surface and/or groundwater is not influenced by economic activities, so there is no significant pollution and the sensitivity of the area in terms of

quality can be considered to be low (taking into account the classification under the 5 sensitivity classes, presented in chapter 7 of this report).

6.6.1.1 Extending the impact

During the execution period of the works, the impact on the quantitative and qualitative regime of surface and groundwater is **moderate**, limited to the works execution area.

During the operational period of the project, the estimated impact on the quantitative and qualitative regime of surface and groundwater is **minor**.

6.6.1.2 Magnitude and complexity of the impact

During the execution of the works, the magnitude of the impact is **moderate, of low complexity,** manifested locally, in the areas where the work zones are located and where the proposed works are executed.

During the operational period of the works, the magnitude of the impact is **minor, of low complexity,** manifested locally in areas where there may be accidental spills of petroleum products, accidental spills of waste water from ships. Large-scale environmental incidents can have a major impact, of a moderate or even major magnitude, but these are only accidental. In these operational situations, the pollution incident response plan is implemented by the port operators.

6.6.1.3 Likelihood of impact

During the works execution period, the impact generated on the qualitative and quantitative regime of water sources is limited to the areas where the works are carried out.

6.6.1.4 Duration, frequency and irreversibility of impact

During the execution period, in the event of accidental pollution, the negative impact will be manifested over a short period of time, as the Contractor has the obligation to intervene immediately to stop the source of pollution and its spreading outside the area of execution of the works and to notify the authorities in charge.

6.6.1.5 Conclusions of the Water Body Impact Assessment Study

After analysing the impact of the project on the water bodies, it was found that the project does not pose a risk of deterioration of the status of the water body in terms of quality elements. Even if the project itself is a large-scale one, the need for the mentioned works is of great importance because they are aimed at the realisation and exploitation of the waterway, through the uses provided which will lead to the achievement of economic and social objectives that will generate important benefits, such as:

- ***navigation*** - linking Bucharest with the Danube ensures direct access to the port of Constanța, to the main cities along the Danube, as well as to the European inland waterway network;
- **flood defence** for 11 localities, 9,800 households, approx. 50.000 ha of land, 378 km of roads, 5 km of railway and 126 socio-economic objectives;
- **water supply and irrigation** - to neighbouring localities, irrigation of approx. 50 thousand ha., dewatering of approx. 30 thousand ha, production of electricity - 126 GWh/year, as well as fish farms on 1,250 ha;
- ***social benefits*** - by providing conditions in the area for: the development of related objectives and activities, the creation of logistic zones and industrial parks, the increase of the economic potential of the neighbouring localities, including job creation and the absorption of unemployment.

Article 4(7) of the Water Framework Directive, transposed by **Article 2(7) of the Water Act No.**

107/1996, as amended and supplemented, sets out the conditions for exemption following new changes in the physical characteristics of a surface water body as a result of new human activities of sustainable development.

Water Act No. 107/1996 transposes Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy and **Article 2(7)** is **Article 4(7)** of this Directive:

Art. 27 - (1) There shall be no breach of the objectives set out in Art. 2[1] paras. (1) and (2) when:

- *(a) failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater;*

(2) The provisions of para. (1) will apply only where all the following conditions are met:

- *(a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;*
- *b) the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan and the objectives are reviewed every six years;*
- *(c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraphs (1) and (2) are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development;*
- *(d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option."*

6.6.2. Air

Chapter *4.2. Air* of this report describes the status of this environmental factor, in all three counties where the objective will be located, based on the information made available on the websites of the Environmental Protection Agencies of each county.

6.6.2.1 Sources and pollutants generated during the works

The sources of air pollution will be differentiated according to the specifics of the works, i.e. they will consist of the activity carried out within the site organisation, borrow pits, on the work site/work zones, and traffic on the access roads to the site.

Emissions during construction works are mainly associated with earthmoving (land clearing, limestone excavation, backfilling), handling and transport of some materials. Dust emissions often vary substantially from day to day, depending on specific operations, prevailing meteorological conditions, mode of transport of materials.

The main pollutants released into the atmosphere during construction are carbon monoxide, lead, nitrous oxide, dust, carbon dioxide and hydrocarbons.

According to Order 462/93, ***emission of pollutants*** means "the discharge of solid, liquid or gaseous pollutants into the atmosphere from point or surface sources".

According to the same regulation, preventive emission limitation standards are: "standards relating to the maximum concentrations of pollutants authorised to be emitted into the atmosphere by the various anthropogenic activities" and " ***immissions***: "transfer of pollutants in the atmosphere to a receptor" (man and his ecological system factors, material goods, etc.).

For the area covered by the present study, pollutant emissions may come from mobile combustion sources specific to road transport, stationary sources on the construction site (material storage, activities specific to the organisation of the construction site).

Currently, there are no stable sources of air pollution in the target area. The only sources of air pollution at the proposed site are motor traffic, agricultural activities and the activity of the quarry pits on the Argeș River.

6.6.2.1.1 Circulation of vehicles for the transportation of materials and machinery

The following specific types of means are considered to be used for the execution of the works:

- means for transporting materials from supply bases;
- machinery to carry out the works;
- means for transporting construction materials to the construction site.

The following will be used: excavators, long reach excavators, bulldozers, compacting rollers, suction dredgers, cutter dredgers, tower cranes, crawler cranes, concrete mixers, dump trucks, etc.

If there are electrified railways in the area, it is recommended to use the facilities offered by these railways for the transport of materials such as fuels, prefabricated elements, additives, etc. The specific emissions of pollutants into the environment generated by the supply of materials using railways are insignificant and the traffic is part of the traffic on the related existing infrastructures and is carried out off the site of the objective.

The main pollutants that are emitted into the atmosphere during the construction period due to motor vehicle traffic are: carbon monoxide, lead, nitrogen oxide, dust, carbon dioxide and hydrocarbons.

Given that pollutant emissions from motor vehicles occur close to the ground, their maximum impact on air quality occurs (except for the centreline of the path) in the vicinity of the traffic lane at human breathing level (effective emission height is about 2 m).

The level of pollutant concentrations depends on:

- traffic intensity and types of vehicles
- meteorological conditions of pollutant dispersion.

On the linking roads to the construction site, the circulation of vehicles transporting materials will contribute to increased air pollution through dust generated from unpaved roads and substances released in the exhaust gases.

For heavy duty vehicles, estimates in the US literature relate pollutant emissions to the level of engine technology, fuel consumption per unit of power or per 100 km, vehicle age, etc.

American methodologies estimate an average fuel consumption of 29.9 l/100 km for diesel heavy duty vehicles, while 16-tonne tippers manufactured in Romania have a fuel consumption of 40-45 l/100 km.

The specific consumption per 1 tonne of material transported is about 2 times lower than the consumption of 16 t tippers.

In Table 48 we present the emission factors for cars and heavy-duty vehicles according to the literature.

Table 48 - Emission factors (gr/km)

VEHICLE TYPE	CO	HYDROCARBONS	NO_x	PARTICULATE MATTER
With catalyser	0.02	0.10	0.61	0.18
No catalyser	0.60	0.10	0.79	0.29
Cars < 2000 ccm	0.5	0.105	0.4	0.131
Cars > 2000 ccm	0.5	0.105	0.7	0.131
Cars < 3.5 t	1.5	0.7	1.3	0.6
Cars 3.5- 5.5 t	2.0	1.0	6.0	1.0
Cars 5.5- 12.0 t	4.0	2.5	10.0	2.0
Cars 12.0- 15.0 t	4.5	3.0	13.0	2.5
Cars > 15.0 t	5.0	3.5	20.0	3.0

Given that some construction companies are equipped with state-of-the-art vehicles manufactured abroad, it can be assumed that construction site activities will not have a particular impact on air quality in and adjacent to the working areas.

The release of dust into the atmosphere also occurs during the handling of earth, raw rock at the point of excavation and during their transport. The amount of dust released depends very much on the quality of the rockfills, i.e. whether they are dusty, dirty or destroyed during handling.

6.6.2.1.2 Operation of machinery in the working zones

Particulate matter emissions vary on a daily basis, depending on the specifics of the operations as well as meteorological conditions.

Pollution specific to machinery activity is assessed according to the area over which these activities are carried out (pollutants are: particulate matter and sedimentable particulate matter) and by fuel consumption (pollutants NOx, CO, NMVOCs, particulate matter from fuel combustion, etc.).

The amount of suspended particulate matter will be proportional to the area of the ground on which the work is carried out.

The impact of particulate matter emissions on environmental factors is greatest during unfavourable meteorological conditions (wind speed of 1 m/s or less).

Airborne particulate matter from machinery is added to particulate matter from means of transport on sectors where both activities are carried out.

Cumulative effects in these areas may lead to concentrations higher than the maximum permissible concentrations under the meteorological conditions mentioned above only for limited periods of time.

Emissions of pollutants into the air due to the combustion of fuels in machinery engines depend on the number and type of machines working simultaneously on a working zone.

For machinery activity, environmental pollution, mainly air pollution, is assessed according to diesel consumption (for emissions of pollutants specific to fuel combustion: NOx, CO, SO_2, particulate matter) and activity-specific (for emissions of suspended particulate matter and settleable particulate matter).

6.6.2.1.3 Pollutant sources and emissions at borrow pits

The specific operations carried out in borrow pits are:

- *opening and exploitation phase*, including:
  - topsoil removal
  - gathering the earth in heaps
  - excavating the earth and loading it into dumper trucks for transport to the work site
  - development and maintenance of farm roads
- *the closure phase* involves:
  - earthworks and dump bank sloping
  - fillings
  - levelling dump surface.

The sources associated with these activities are open sources (dust release), and emissions are not regulated either domestically or internationally. Operation of the borrow pits is expected to be continuous throughout the construction period. In addition to dust emissions, there are emissions from road traffic involved in the transport of materials and emissions from machinery operating in the borrow pit.

Applying the above-mentioned methodology, Table 49 shows the pollutant (dust) emissions by category of works at the level of the borrow pit.

Table no. 49 - Emissions of pollutants (dust) at borrow pits

No.	*Work category*	*Particle mass flow rates by size spectrum (kg/h)*			
		d≤ 30µm	*d≤ 15µm*	*d≤ 10µm*	*d≤ 2.5µm*
OPERATION					
1	Topsoiling + gathering	32.6	7.5	5.5	3.3
2	Excavation + vehicle loading	248.2	57.4	43.8	24.4
3	Cleaning + gathering	24.9	5.9	4.4	2.4
TOTAL		305.6	70.8	53.7	30.1
CLOSING					
1	Earth unloading + dump	12.3	3.7	3.1	0.7
2	Earthworks + levelling	207.7	47.5	35.6	21.6
TOTAL		220.0	51.3	38.7	22.2
EROSION		3.7	2.6	2.0	0.7

The same values of particulate mass flow rates can also be taken into account in the case of dam completion and construction.

The impact analysis has been carried out for all pollution sources presented in this chapter, considering maximum emission regimes. Analyses were made for the emissions from:

- Works carried out on the work sites and road (including engineering and collateral works);
- activities at the site organisation
- activities at the site of borrow pits (if necessary)

The period corresponding to the maximum earthworks will also represent the period of maximum impact on the atmosphere.

As can be seen from the above, emissions of pollutants from the sources within the site organisation are in compliance with the provisions of Ministerial Orders 462/1993 and 592/2002, under the conditions specified for each source. Emissions from motor vehicles must comply with the technical conditions imposed during the periodic roadworthiness tests carried out on all road vehicles registered in Romania.

6.6.2.2 Sources and emissions during operation

The hydrotechnical works to be carried out do not generate air polluting emissions during operation. The only sources of air pollution will be emissions from shipping and port activities.

Pollutant emissions from ships

Among the energy compartments of a ship, the machinery space is the main source of gaseous toxic gases, present in a wide range of primary substances (gases and solids), secondary substances that can form photochemical and wet smog.

The specialised literature identifies three basic systems for thermal engines in vessels:

- engine exhaust
- crankcase lubrication and ventilation
- fuelling

as potential sources of pollution by toxic gaseous pollutants and hydrocarbons (simple and complex such as polycyclic aromatics, PACs) with immediate or delayed effects ranging from irritant to carcinogenic and mutagenic effects.

Based on the literature data it has been possible to estimate the amount of emissions resulting from the operation of a tug, for example, or a pusher. The results are shown in Table 50.

Table no. 50 - Emissions from the operation of a tugboat

Composed	***Calculation formula***	***Result (kg/hour)***
NO_x	$17.5 \times 10^{-3} \times P \times N$	1.64
CO	$0.68 \times 10^{-3} \times P^{1,08} \times N$	0.063
HC	$0.28 \times 10^{-3} \times P \times N$	0.026
SO_2	Not applicable for engines with P<2000 kWh	-

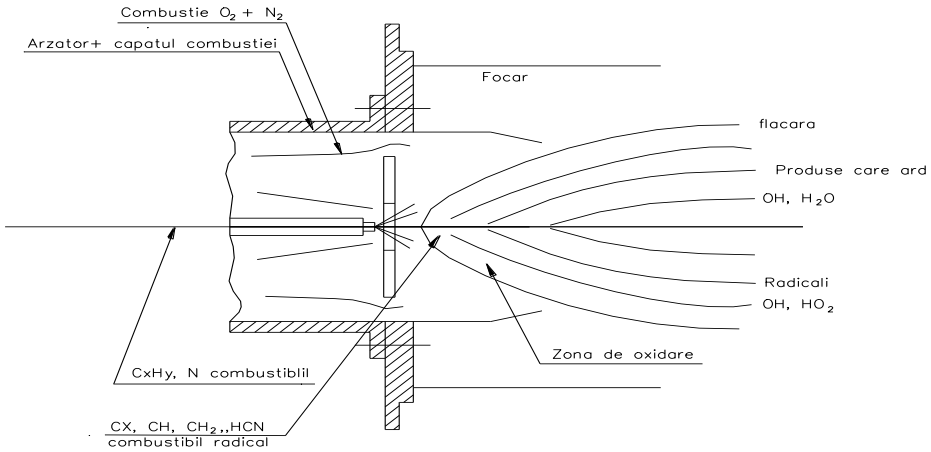
where:

P is the power developed by the engine at 85 per cent of the total power demand

N is the number of motors running simultaneously.

For ships, exhaust emissions contain mainly nitrogen (N_2), oxygen (O_2), carbon dioxide (CO_2), as well as small amounts of carbon monoxide (CO), sulphur oxides (SO_x) and nitrogen (N_xO_x), hydrocarbons (C_xH_y) reacting with non-combustible materials.

The figure below shows schematically the relationship between the source of the gas resulting from the combustion of the fuel and the main categories of carbon derivatives, and oxygen in the form of oxides or free radicals of unburned hydrocarbons.



These toxic substances are removed with the components of the exhaust gases.

Statistics for marine engines show the proportion of basic toxicants accompanying exhaust gases compared to crankcase gases:

- Exhaust gases: CO – 98%; CH – 90%; NxOx - 98%
- Crankcase gases: CO – 2%; CH – 2%; NxOx - 2%

Shipping makes a small contribution to total atmospheric emissions compared to cars and plants such as thermal heating systems. A study by the Norwegian Research Institute of Marine Technology in 1989 estimated that international shipping contributes about 7 per cent of total global discharges of nitrogen oxides (NOx) and about 4 per cent of sulphur dioxide (SO_2). However, it is well known that in certain areas, local or regional, with a high volume of trade, discharges to air from shipping make a significant contribution to air pollution.

6.6.2.3 Sources and pollutants generated during decommissioning

During the decommissioning period, the main sources of air pollution are similar to those during the construction period, but depend on the area on which the decommissioning works will be carried out, the location of the site and especially the related activities that will be taking place at that time in the neighbouring areas.

6.6.2.4 Impact assessment

Considering the type of works proposed to be carried out, the technical information available at this stage of the project, the technical details and the details related to the equipment used during the execution of the works, and on the basis of which an estimation of the impact that the project, during its execution, may have on the air, such impact is **moderate**.

During operation, under normal operating conditions the estimated impact on the environmental factor air is **minor**. In the event of environmental incidents, fires, non-compliant operation of equipment in the target areas, the impact may be moderate or even major, and the accidental pollution response plan is implemented.

6.6.2.5 Sensitivity class

The works that are the object of this study are located within and/or outside the built-up area of the TAUs of the three counties intersected, as specified in the previous chapters and as can be seen from the attached plans.

Based on the analysis of the current environmental status (presented in chapter 4 of this report) in the area of influence of the project, the air quality status is not influenced by economic activities, so there is no significant pollution. The air quality parameters do not exceed the limit values stipulated in the legislation in force for human health, for the indicators analysed, thus, it can be considered that the sensitivity of the area in terms of air quality is low (taking into account the classification of the 5 sensitivity classes, presented in chapter 7 of this report).

6.6.2.6 Extending the impact

During the works there is a risk that air quality may be affected if the measures proposed in this report are not taken into account. By implementing the measures, there will be no risk of significant air quality impairment, there will be no risk of extending the impact beyond the area of the working zone (there will be a point impact in the work zone).

6.6.2.7 Magnitude and complexity of the impact

The magnitude of the impact is small and of **low** complexity.

6.6.2.8 Likelihood of impact

The likelihood of a potential significant negative impact is **low**.

6.6.2.9 Duration, frequency and irreversibility of impact

During the execution period, the negative impact on the air is limited to the area where the works are located (the area of the work zones), is not continuous (it appears only during the period of execution of the works) and will cease once the works are completed.

6.6.3. Soil and subsoil

Chapter *4.4. Soil* described the soil condition in the three counties covered by the project area/site, based on the information from the *Annual Environmental Status Reports* taken from the websites of the Environmental Protection Agencies of Ilfov, Giurgiu and Călărași counties.

As described in the chapter on the current status of the project, part of the land area allocated to this project is occupied by the construction works erected so far. These buildings were in a more or less advanced state of disrepair, according to the technical expert reports prepared.

Also, as no maintenance or other works have been carried out there, the area has been "invaded" by alien species, there are inappropriate waste dumps on the land (in places such as: km 79+896.35; km 79+197.72; km 73+323.79; km 71+169.15; km 65+404.51), so that the soil condition has degraded. Details are set out in section 5.9. - Landscape.

This land will be cleared of existing vegetation (alien species), there will also be clearing works as outlined in previous chapters, there will be demolition and/or re-erection of existing buildings, temporary or permanent land take-up as set out in this report.

With the implementation of the project, it is expected that the soil condition will be improved by the proposed control works, land clearing, etc., so that the risk of contamination will be low.

The project does not involve the use of chemicals that could pollute the soil, either during the construction phase or during the operation phase (using the waterway for transport on the Argeș and Dâmbovița rivers).

Also, as already mentioned, the project mainly involves the extraction of material from the area by dredging and excavation for the creation of the navigable fairway.

6.6.3.1 Sources of soil pollution and associated impacts

6.6.3.1.1 Construction period

Powders resulting from the processes of excavation, loading, transport and unloading of earth can only be considered as pollutants to the extent that they are associated with other pollutants (e.g. SO_2 with dust particles).

During the execution period there are a number of changes in the quality and structure of the soil due to the occupation of some areas by the site organisation, borrow pits. Forms of impact identified during this period can be:

- topsoil removal and creating an artificial profile in the area where borrow material is taken;
- the occurrence of soil erosion
- concreting of certain areas of the work reserve area or site organisation
- loss of the natural characteristics of fertile soil through improper storage in soil pits resulting from topsoil removal
- accidental pollution by hydrocarbons or other substances, as well as by faecal and domestic waste water
- uncontrolled dumping of waste, construction materials, technological waste.

On completion of the works, the site organisation will be dismantled, the site will be cleaned up and the current site and access roads will be restored to their original state before the works started.

When the works for the complex river control works on the Argeș and Dâmbovița rivers were halted in January 1990 and the site was left, the following main works had been performed:

- ✓ The following volumes of control works had been performed on the ***Argeș river*** for navigation:
  - 73% of the total volume of 96.9 million m^3 of excavations;
  - 69% of the total volume of dykes totalling 47.8 million $m^{3;}$
  - 39% of the quantity of 2,125 thousand m^3 of concrete;
  - 46% of the 1285 thousand m^2 of concrete cut-off walls;
  - 36% of the area of defences and embankment protection totalling 4.6 million $m^{2;}$
  - 24% of the total quantity of hydromechanical equipment of approx. 11.4 thousand tonnes.

Moreover, more than 80 per cent of the following works had been executed:

- infrastructure of the platforms of Oltenița and Bucharest ports;
- bridges over roads and the railway bridge at Grădiștea over the navigable Argeș river;
- crossings of power lines and pipelines over the improved river;

- the most difficult works were also at an advanced stage of execution, such as:
- the foundations of hydrotechnical nodes (the floor beds of locks, wasteways and hydroelectric power plants);
- the outports related to hydrotechnical nodes.

✓ The following control works had been performed on the ***Dâmboviţa river*** for navigation:

- river bed development in the 3rd reach, between the port of Glina Harbour and the HN of Tânganu;
- works for the defence and protection of the slopes on the 3rd reach with reinforced concrete slabs;
- at the Port of Glina, the mooring quays and approx. 30% of the port platforms had been built;
- at the HN of Tânganu, the simple lock is limited to concreting the lock chamber up to the level and construction of the upstream head;
- partial roads for emergency interventions on the Glina - Tânganu reach.

Downstream of the HN if Tânganu, on the Dâmbovița river, no works had been carried out to improve navigation.

The volume and state of the works performed on the two rivers up to the end of 1989 have been mentioned above. The updated value of the works performed until the end of 1989 on the Argeș and Dâmbovița rivers amounts to more than €2.7 billion, excluding VAT.

By Government Decision No 487/2008, the Ministry of Transport through Compania Naţională Administraţia Canalelor Navigabile SA (National Company for the Administration of Navigable Canals) took over from the Ministry of Environment and Sustainable Development under the administration of the National Administration "Romanian Waters" the objective "River control works on the Argeș River for flood defence, irrigation and other uses", as well as some state-owned public property on the Dâmbovița river, in order to create a navigable waterway from Bucharest to the Danube, through the new objective: "*River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses*".

Given the fact that the project involves the realisation of new objectives in the site area, as described in the previous chapters, it will be necessary to occupy new areas of land, as also stated in this report.

The total land area, by each TAU and land use category, is detailed in Annex 4 to this report.

This has a significant source of impact, especially on the soil by changing its use from agricultural land, pasture, etc. to land used for construction, but also on the social factor, reducing the amount of land used for other purposes (agriculture, pasture, etc.). However, by comparing the entire land area to be occupied by the project for each county, by each category, to the area by categories of use/county, the impact will be insignificant.

For example, in Călărași county, the entire area of land to be permanently occupied is 15,109,550 square metres (1510.9550 ha) of which 308.9625 ha is agricultural land. According to the annual environmental report at the level doe 2023, the area of agricultural land in Călărași county was 423,469 ha. When the area occupied by the project (308.9625 ha of agricultural land) is related to the total area of agricultural land (423.469 ha), the percentage occupied is less than 1%, which means an insignificant negative impact.

Other sources of impact during the works are:

✓ excavation works, earthworks that may lead to physical and structural changes to the soil in the project area

✓ accidental spillages of fuel and/or oil or substances with a high content of hazardous substances/chemicals which may lead to impairments of local soil quality

✓ uncontrolled storage of waste/materials on the premises of site organisations and/or work zones which may lead to impairments of local soil quality

- ✓ changes in soil quality under the influence of airborne pollutants (deposition of pollutants on soil) that can lead to local changes in soil quality
- ✓ temporary occupation of land for storage of materials, organisation of construction sites, work zones, areas for stopping/parking of machinery, etc. which may lead to local changes in soil quality.

6.6.3.1.2 Operation period

There are no direct sources of soil pollution during the operation period. The permanent occupation of certain areas of land (for the construction of proposed future objectives) can be considered as an indirect source of pollution due to the specific nature of the works.

The realisation of this project will have a positive impact on the soil but also on the social factor, by:

- flood defence - 11 localities, 9,800 households, approx. 50.000 ha of land, 378 km of roads, 5 km of railway and 126 socio-economic objectives;
- water supply and irrigation - to neighbouring localities, irrigation of approx. 50 thousand ha., dewatering of approx. 30 thousand ha, production of electricity - 126 GWh/year, as well as fish farms on 1,250 ha;
- in the hydroelectric power plants built in the hydrotechnical nodes on the lower Argeș river, about 58 KWh/year of electricity will be produced annually, to which 15 GWh/year of electricity will be added, i.e. the energy produced in the hydrotechnical nodes of Tânganu and Cucuieți on the Dâmbovița river;
- the possibility to realise fish-farms on up to 1,250 ha;
- favourable conditions for the development of recreation and tourism activities in the area;
- favourable ecological influences, given that the water transport alternative is less polluting than the other modes of transport, as well as the fact that, by creating an important water body of about 3,000 ha, plus almost 1,000 ha on the Dâmbovița, in an area with a rainfall deficit, it leads to positive influences on the microclimate.

The flood protection works designed to safeguard settlements and land against inundation are diverse and include: frontal drainage along dams, counter-channel systems, drainage mattresses/arms at the outer base of dams, water evacuation systems for low-lying zones, as well as drainage systems designed to protect settlements against seepage.

6.6.3.1 Impact assessment

Considering the type of works proposed to be carried out, the technical information available at this stage of the project, the technical details and the details related to the equipment used during the execution of the works, and on the basis of which an estimation of the impact that the project, during its execution, may have on the soil, such impact is **moderate**.

During operation, under normal operating conditions the estimated impact on the environmental factor soil is **minor**. In the event of environmental incidents, fires, non-compliant operation of equipment in the target areas, the impact may be moderate or even major, and the accidental pollution response plan is implemented.

6.6.3.2 Sensitivity class

As stated above, the land to be permanently occupied by the works that are the subject of this project is agricultural land, land intended for buildings and adjoining areas, forest, non-agricultural land in different areas for each of the three counties where the project will be located.

Thus, in terms of sensitivity class (as presented in Chapter 7), the area where the works are located falls under the **moderate** sensitivity zone.

6.6.3.3 Extending the impact

During the execution of the works, the impact will be felt exclusively in the area where the works are being carried out and in the immediate vicinity of the works.

6.6.3.4 Magnitude and complexity of the impact

The magnitude of the impact is small and of **low** complexity, occurring only during the works, in the project areas or in their immediate vicinity.

6.6.3.5 Likelihood of impact

During the execution of the works, the impact on the soil will be limited to the areas where the works will be carried out or in their immediate vicinity.

6.6.3.6 Duration, frequency and reversibility of impact

The impact on the soil will occur only for the duration of the works, after their completion the land will be restored to its original state, where this is foreseen in the project.

6.6.4. Biodiversity

6.6.4.1 Construction period

Land occupation, direct vegetation change, poor biodiversity management

Activities during project implementation may have a direct negative impact on terrestrial vegetation and fauna **through the temporary occupation** of areas by site construction and borrow pits/quarries for local materials. This type of impact is difficult to quantify.

The deforestation foreseen by the project refers mainly to the removal of vegetation that has grown over the existing built structures during the abandonment of the construction site, as well as the area adjacent to the project, which is heavily anthropized, representing anthropogenic, non-productive and riparian biomass, characterised by predominantly invasive, ruderal, common shrub species and not including habitats of conservation importance, which are absent from the project area. The project area, for the most part, does not provide habitats required by fauna species of conservation importance, no specific breeding sites located within the perimeter of the deforestation were identified during field investigations, except for certain areas highlighted below.

The estimated area of deforestation outside PNACIs was estimated at **922761 square metres.** The stand composition of the cleared areas is currently unknown and will be clarified in the next phase of the engineering project. Because of this it is not possible to make accurate estimates of the level of negative impact through deforestation.

Thus, according to field investigations, the planned works for the development of the Dâmbovița-Argeș-Danube Navigable Canal may generate various forms of impact on the vegetation along this route, especially in alluvial habitats with a meadow character and in temporarily flooded microhabitats. Although plant communities compatible with habitat 92A0 have been identified, this habitat does not have the ideal structure described in the literature. Fragmentation and invasions by alien and ruderal species show a partial compatibility, significantly affected by anthropogenic influences.

Natura 2000 habitat type 92A0, "*Salix alba* and *Populus alba* galleries", is characterised by the dominant presence of white willow, black poplar and white poplar species in stable meadow structures. The mechanised interventions needed to build the canal may destroy the trees and shrubs specific to this habitat, affecting the forest structure and favouring bank erosion and biodiversity loss.

The presence of settlements has had important fragmentation effects on natural habitats, and this has had repercussions over time on fauna structures in different areas.

Although the specific diversity is quite high, it is not followed by high abundance for many of the species that live in the area or only pass through during migration periods. Basically, there are not enough spaces for rest, or for finding accessible food sources in sufficient quantities.

The presence of domestic predators, such as cats and stray dogs or domestic dogs that left their homes for a short time, has a major impact all along the rivers for birds that might find nesting sites. The eggs and nestlings of many species of ground-nesting and low-lying bush-nesting birds can be easily destroyed by these animals.

The reed-beds formed outside permanent pools of water are also accessible to other natural predators (rats, weasels, ferrets, etc.) and are therefore avoided by some Passeriformes for nesting, but also as night roosting areas for large flocks (starlings, swallows, wagtails, etc.) during spring or autumn migration.

In winter, shelter, especially for many aquatic species, is limited to small areas where the water does not freeze, but in these areas they are vulnerable to domestic and wild predators. Their food sources are also very limited.

As regards the risk of spreading of invasive species, **a minor impact** has been estimated, as the plant communities in the project area are strongly affected by the presence of invasive species such as *Ambrosia artemisiifolia, Amaranthus retroflexus, Datura stramonium, Xanthium orientale subsp. italicum, Sorghum halepense, Amorpha fruticosa, Ailanthus altissima, Acer negundo, Robinia pseudoacacia*.

Invasive species such as: *Amorpha fruticosa, Humulus scandens* and *Robinia pseudoacacia*, already present at some vantage points during field surveys, may benefit from soil disturbance caused by works and the opening of new areas of land. These species tend to smother native vegetation, reducing the integrity of habitat 92A0 and disrupting its ecological functions.

The implementation and operation activities of the proposed project may contribute to the spread of invasive species in certain areas, however, overall, the ecological impact of the project will be **positive** due to the sanitation of the area, the ecological restoration of the banks of the Argeș and Dâmbovița rivers, currently affected by anthropisation. We believe that following the creation of the navigable canal the natural vegetation in the area will recover over time by replanting forest species that once formed habitats of conservation importance in the area, and the fauna will have more suitable habitats than before the project and will repopulate the area.

In addition, **8 biodiversity hotspots,** important for birdlife, have been identified along the project route, with clusters of common species and species of conservation importance. Some of these areas are also important for other wildlife classes (herpetofauna, mammals):

1. The Bucharest Ring Road - Glina area, popularly known as the "Glina Delta";
2. Tătaru Fish Farm area, near Plătărești;
3. Dâmbovița-Argeș confluence area;
4. Mihăilești Dam - Argeș area;
5. Neajlov-Argeș confluence area;
6. The area of the Argeș river course in the sector of Șoldanu - bridge over national road DJ403;
7. Area of the Argeș river sector between Curcani-Clătești;
8. Argeș-confluence with the Danube area.

For the mentioned areas the following details are given:

1. Bucharest Ring Road - Glina area, popularly known as the "Glina Delta"

The naturalised floodplain at the Ring Road-Glina (Fig. 165), with reed, permanent shallow (20-40 cm) water holes and sand and gravel small islands, is an important breeding, feeding and resting habitat for common species and species of community importance of ornithological and ornithological fauna. The project's impact on biodiversity will be **moderate**, temporary, through the loss of breeding, feeding and resting habitats - as a result of temporary and permanent land occupation.

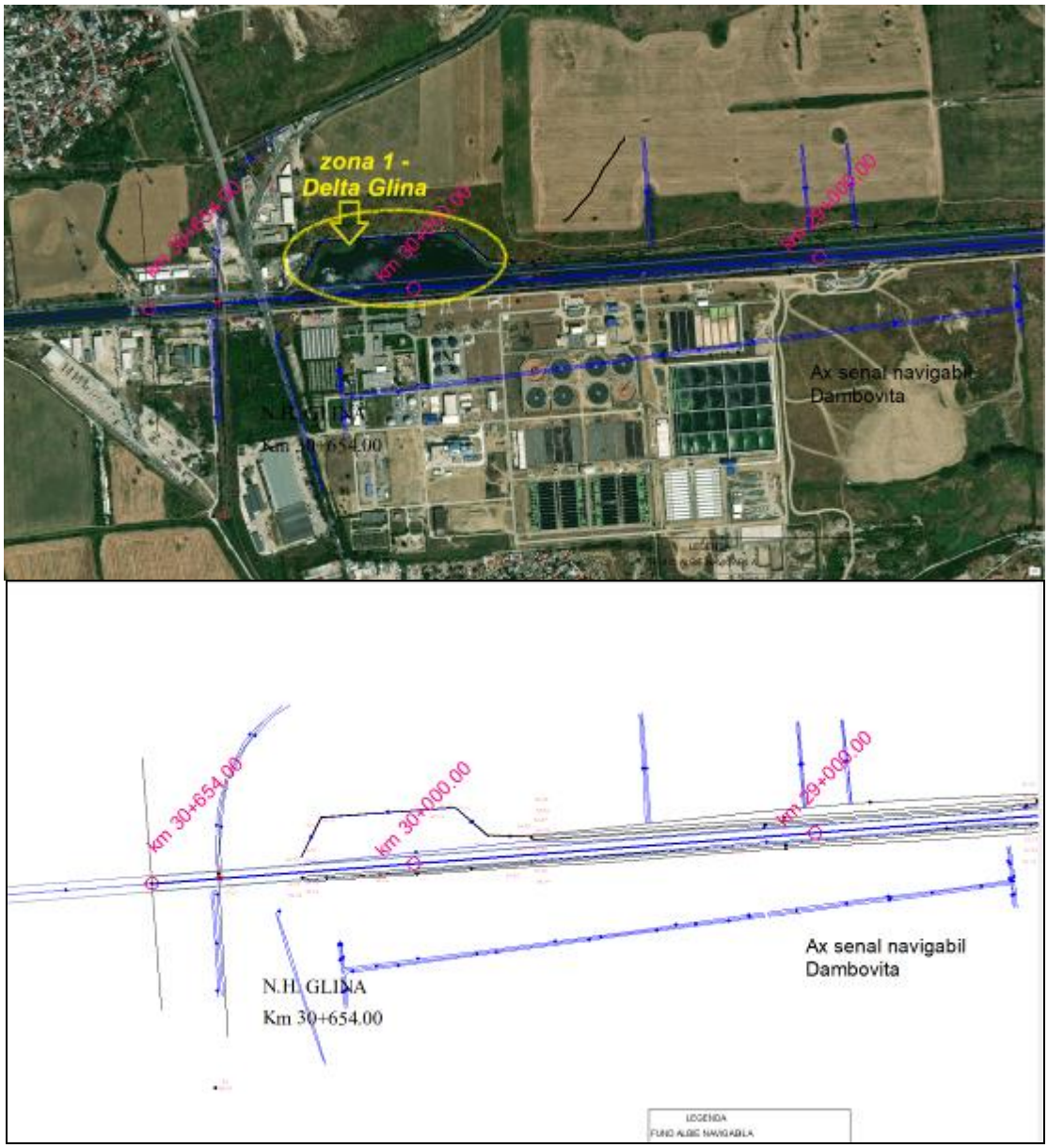


Figure no. 165 - Location of zone 1 - Glina Delta

2. Tătaru Fish Farm area, near Plătărești

In particular, the area standing out here is that of the **Tătaru lake and forest** in **Plătărești**, where the project foresees a diversion of the route from the current course of the Dâmbovița river and cutting its meandering by crossing the lake and the forest (fig. 166). Thus the current estimated area of forest on a large hill that is proposed to be cleared at Plătărești is **28394 square metres**. As the area is populated by faunal species of community importance, **a moderate to major impact** is expected through the loss of key habitats of the highlighted species, some of conservation importance, with a reduction in population numbers and habitat fragmentation.

We note the presence of an additional pressure and threat to the analysed area through the expansion of the Liziera de Lac residential complex, which represents a potential negative cumulative anthropogenic impact with the present project plan on the biodiversity of the lake and the forest.

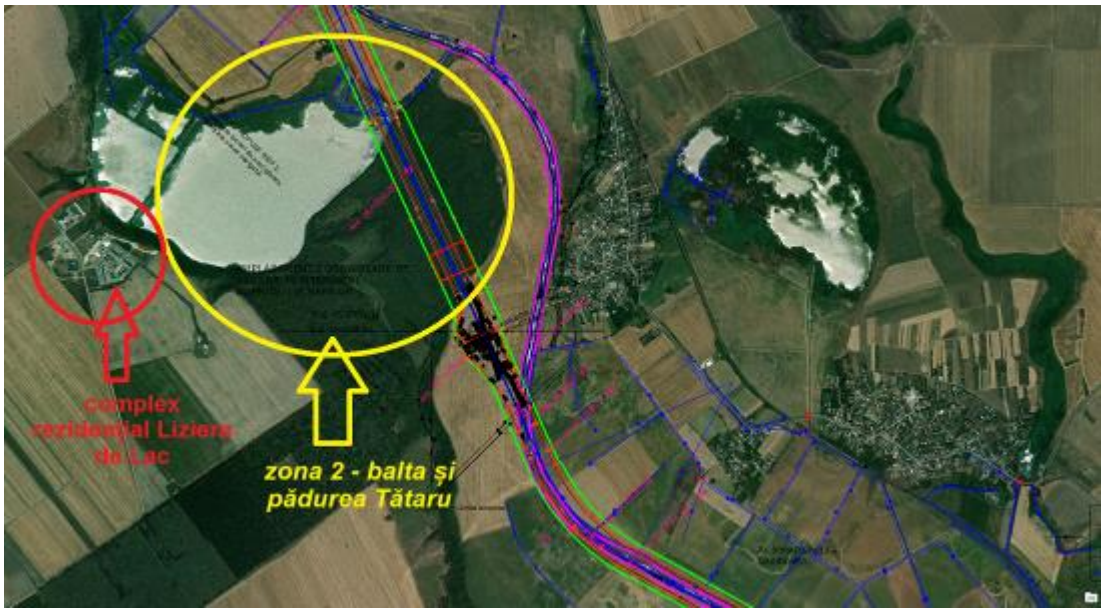
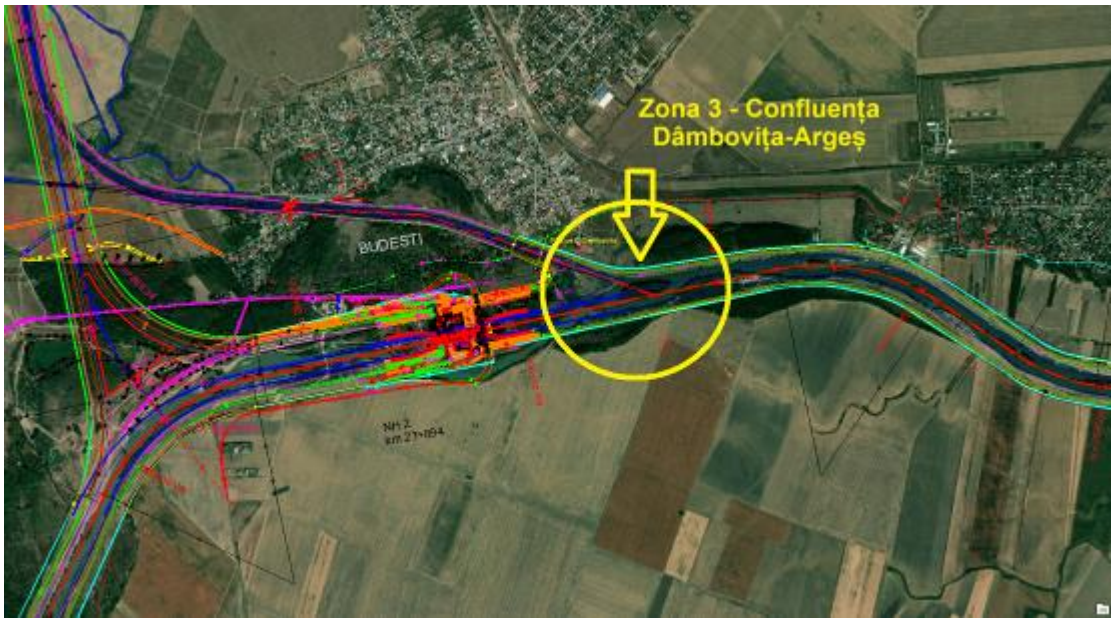


Figure no. 166 - Location of zone 2 - Tătaru Fish Farm

3. Dâmbovița-Argeș confluence area

The area is populated by bird species of conservation interest in different seasons, due to suitable habitats created by the floodplain. The negative impact of the project on biodiversity will be **minor** and will consist of its disturbance (Fig. 167).



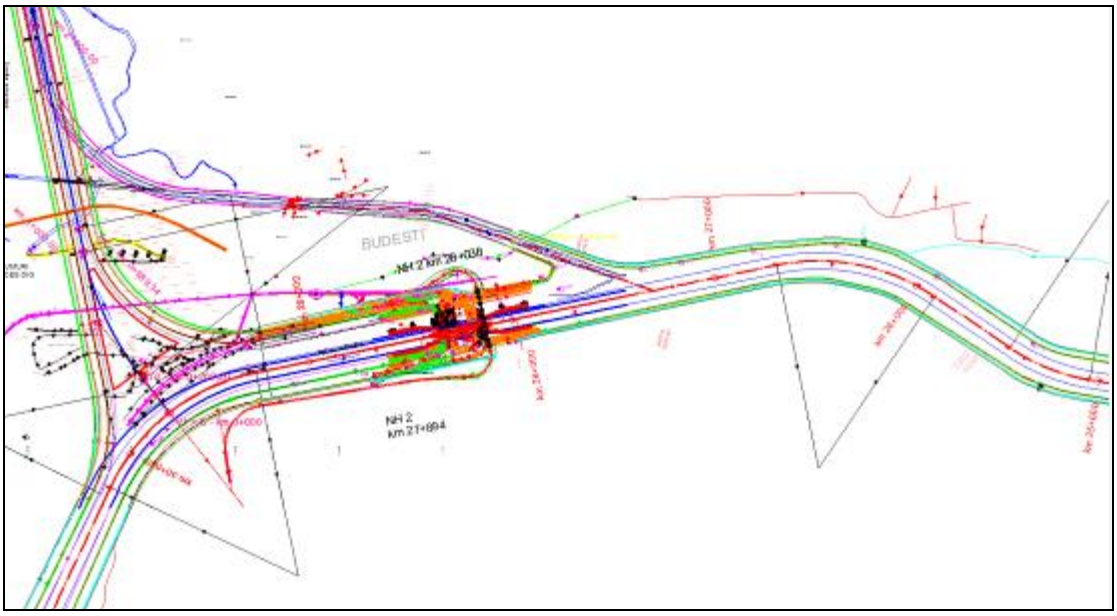
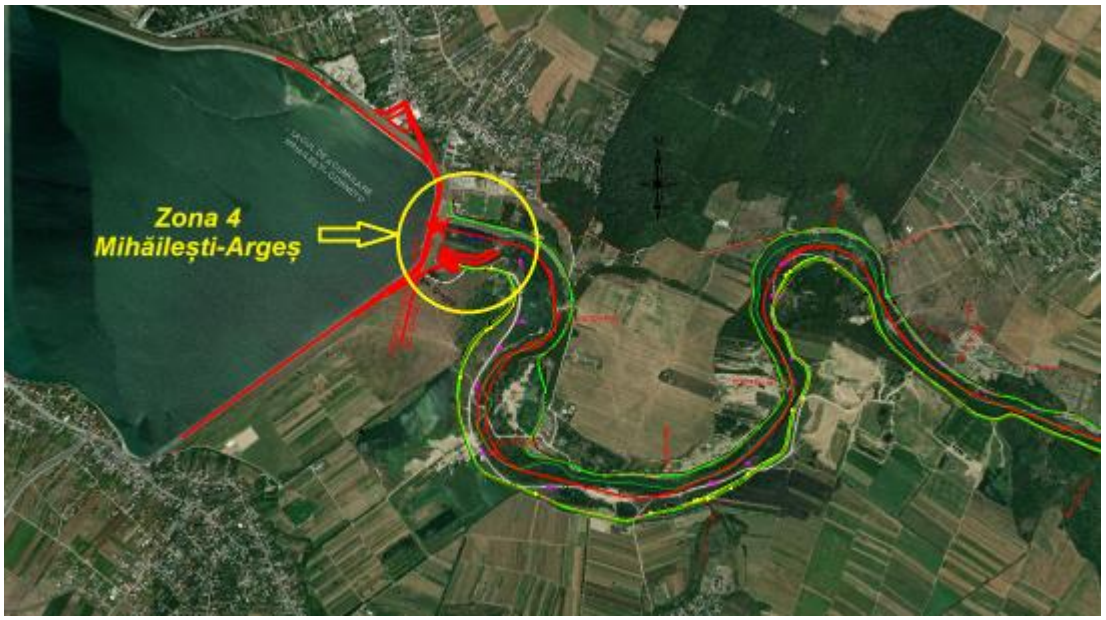


Figure no. 167 - Location of zone 3 - Confluence of Dâmbovița-Argeș rivers

4. Mihăilești Dam - Argeș area

This area represents a transition from a lacustrine to a reophilous ecotope, providing diverse habitats for bird species of conservation concern in different seasons. The negative impact of the project on biodiversity will be **minor**, temporary, through the loss of breeding, feeding and resting habitats - as a result of temporary and permanent land occupation (Fig. 168).



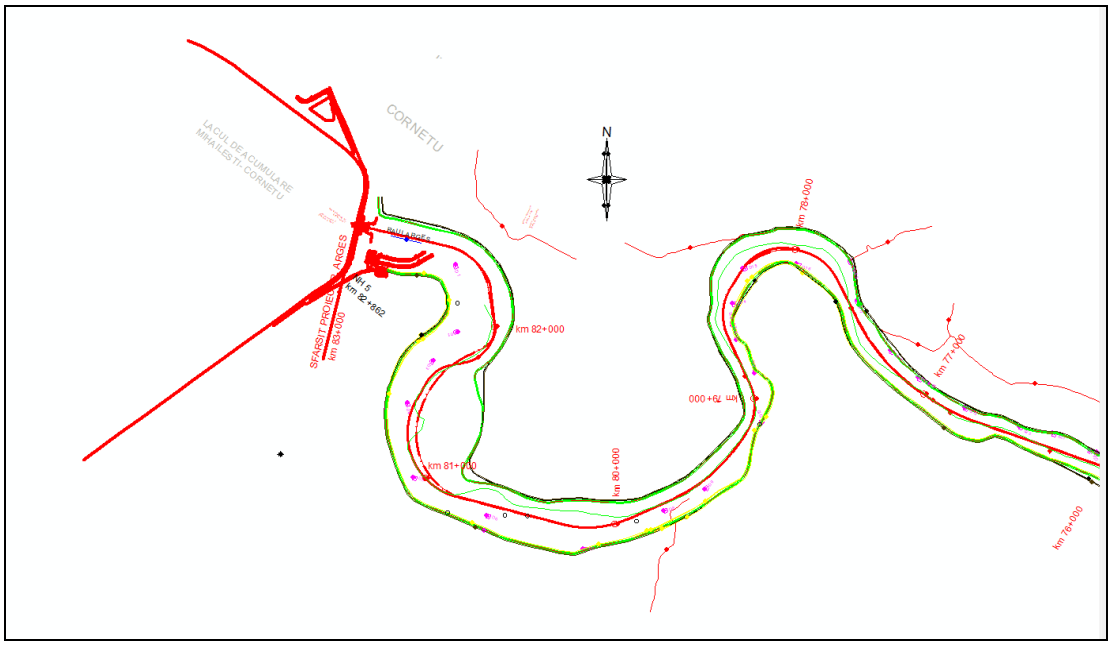
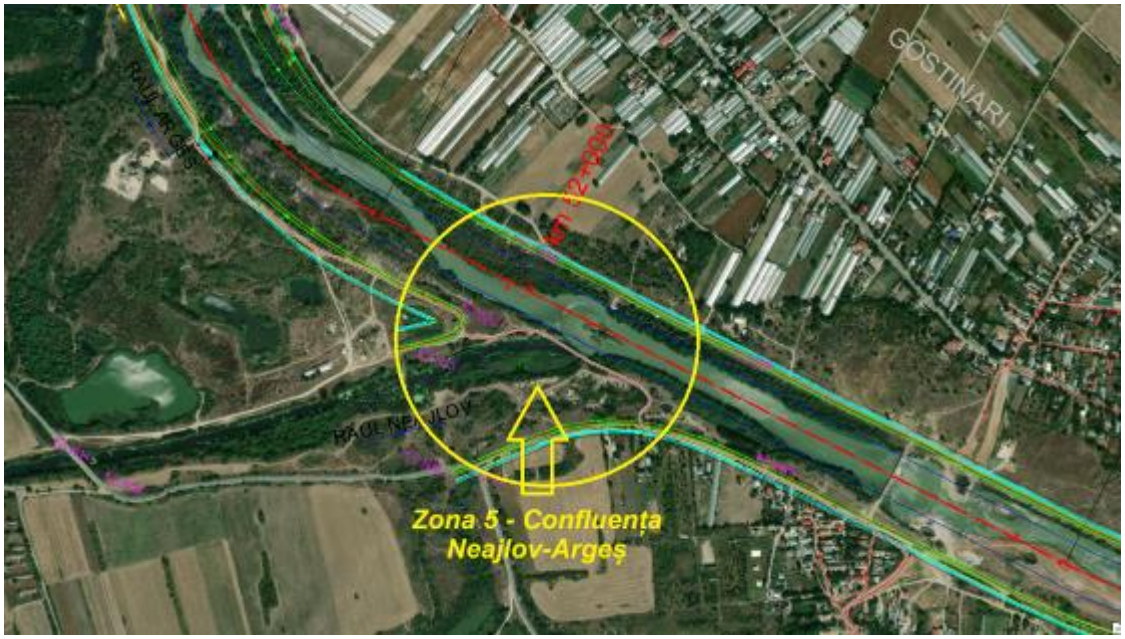


Figure no. 168 - Location of zone 4 - Mihăilești dam - Argeș

5. Neajlov-Argeș confluence area

This area is populated by common bird species. The negative impact of the project on biodiversity will be **negligible** and will consist of its disturbance (Fig. 169).



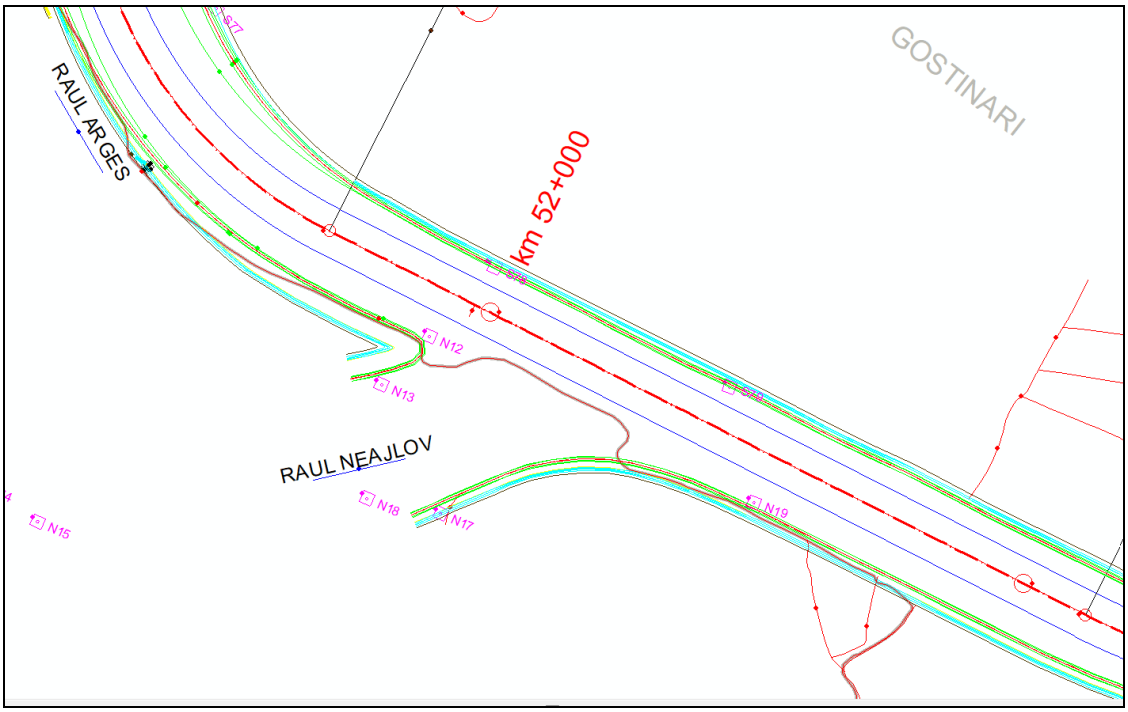
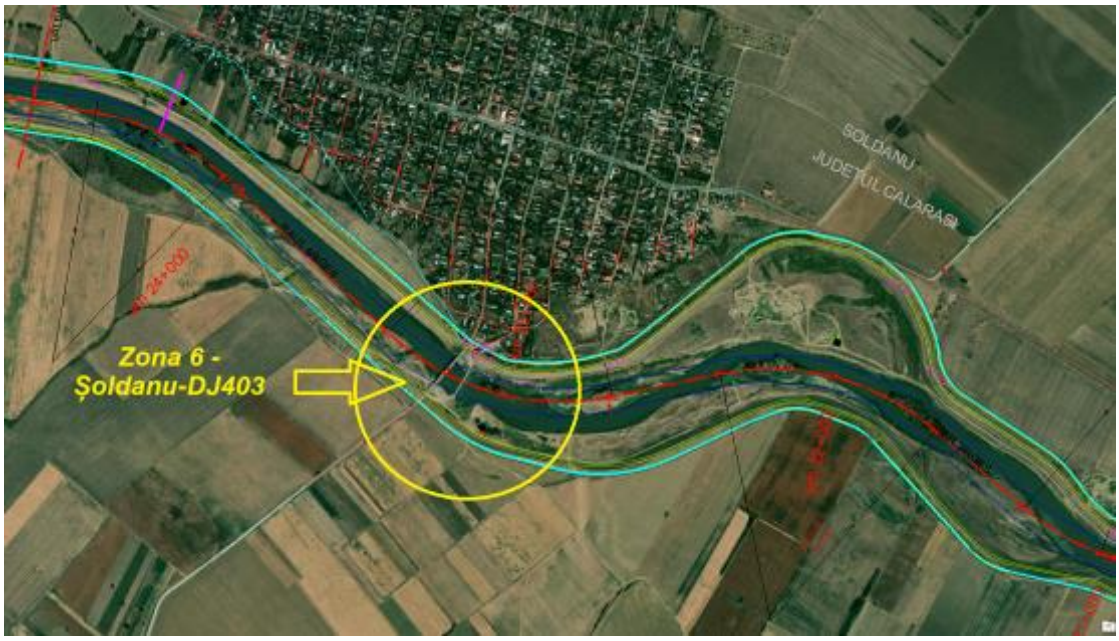


Figure no. 169 - Location of zone 4 - Neajlov-Argeș confluence

6. The area of the Argeș river course in the sector of Șoldanu - bridge over national road DJ403

This area is populated by bird species of conservation interest in various seasons, due to the suitable habitats created by the floodplain, as well as by the ground squirrel *(Spermophilus citellus*) - a species of community interest. The negative impact of the project on biodiversity will be **minor,** temporary, due to the loss of breeding, feeding and resting habitats - as a result of temporary and permanent land occupation (Fig. 170).



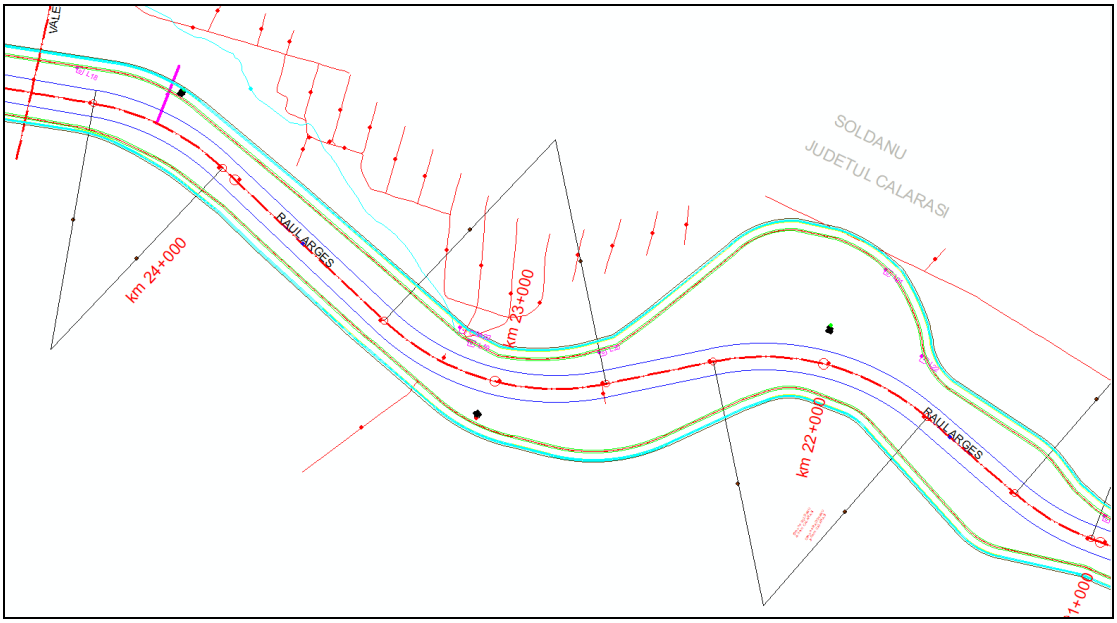


Figure no. 170 - Zone 6 - Șoldanu - bridge over county road DJ403

7. Area of the Argeș river sector between Curcani-Clătești

This area is populated by bird species of conservation interest in different seasons, due to the suitable habitats created by the floodplain as well as by the secondary branches of the river. The negative impact of the project on biodiversity will be **minor,** temporary, due to the loss of breeding, feeding and resting habitats - as a result of temporary and permanent land occupation (Fig. 171).

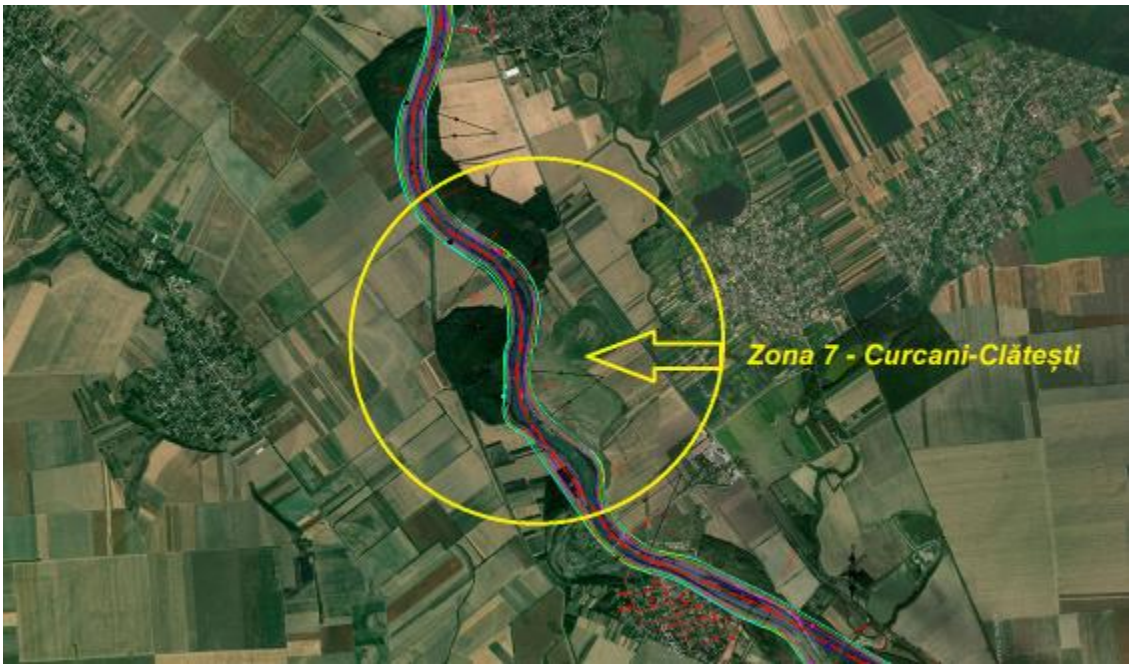


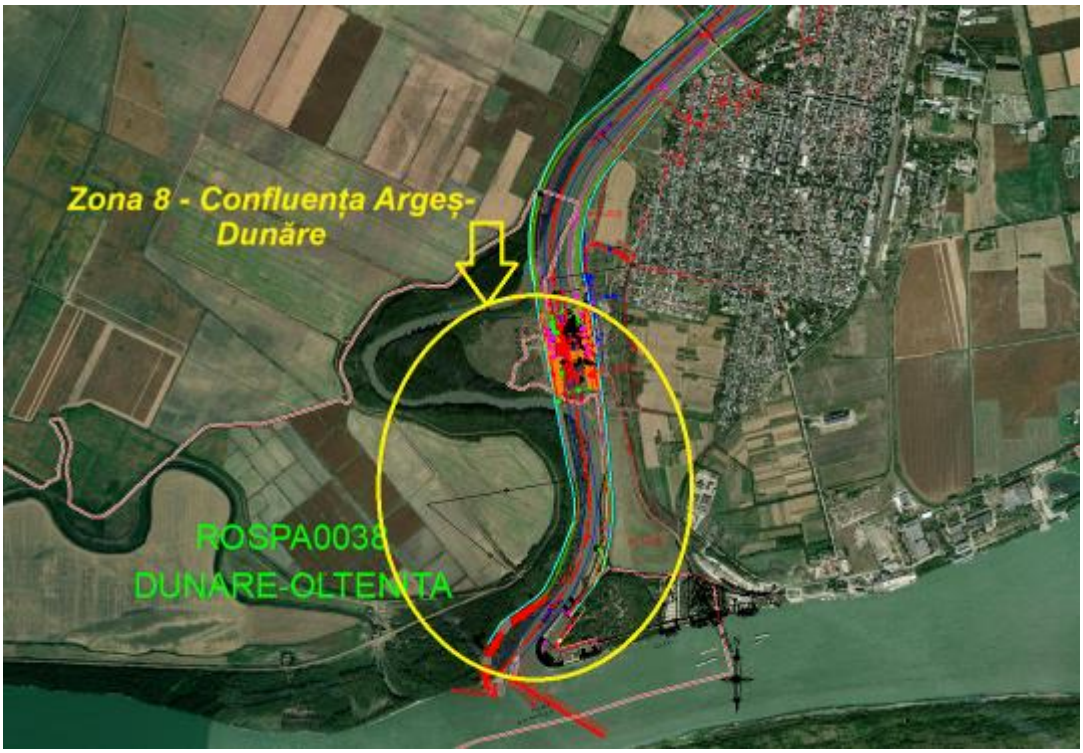


Figure no. 171 - Zone 7 - between the settlements of Curcani-Clătești

8. Argeș-Danube confluence area

Another area identified as sensitive is the confluence of the Argeș-Danube rivers (Fig. 172), where chiropters have been found ported in abandoned canal constructions. Bird species are common, not of conservation interest. A **minor negative impact** is estimated for fauna species currently using the area for habitation, through their disturbance due to loss of breeding, feeding and resting habitats - as a result of temporary and permanent land occupation.

The area of the abandoned lock at the HN1 of Oltenița, at Falaștoaca, was populated by *Marsilea quadrifolia*, a community plant species. As the site has naturally turned into a pond following the abandonment of the construction site, it now provides conditions for the species' population to thrive. A **moderate impact** is expected for this species, which will be permanently removed from the project area by the construction works. The species will be able to colonise adjacent areas of the remaining intact meander at Oltenița-Chirnogi through special mitigation measures.



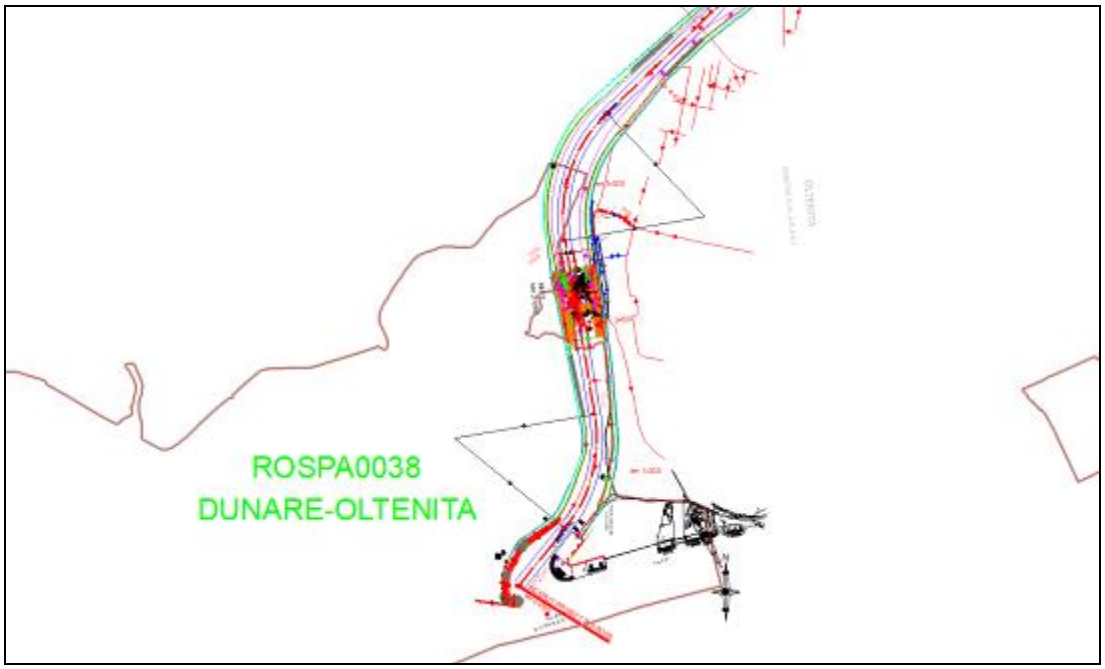


Figure no. 172 - Zone 8 - Argeș-Danube confluence

Changes to the soil or subsoil

Negative indirect impacts can manifest themselves through changes to abiotic environmental factors essential for plant and animal life: water, air and soil.

As the area is degraded and heavily anthropized, no major biodiversity elements of conservation importance will be affected during the soil and subsoil works. In the case of this project, it can be concluded that by complying with the operating regulations no emissions to the soil and subsoil are expected. The amount of sedimentable dust resulting from the technological process of excavation and loading is low, as the area of its spreading is exclusively the site enclosure and its immediate neighbourhood. Emissions of VOCs during operation are low; they occur in the immediate vicinity of the source, with no impact on biodiversity.

A **temporary minor negative impact** is expected during the construction period on biodiversity through disturbance of habitats on the soil and subsoil in the built areas.

Changes in morphological, hydrological, hydrodynamic, hydrochemical conditions

The proposed river control works will disturb a significant surface of the study area and will affect organisms living there in several ways:

- dust from excavation of slopes and transport of construction material on the unpaved road(s) can be carried by the wind, affecting vegetation by blocking stomata and reducing the respiration/photosynthesis surfaces, but also by clogging the spaces between sand grains;
- vibrations caused by traffic are perceived by living organisms, depending on their characteristics, either as vibrations or noises. The latter, especially those of high intensity, affect animal organisms, disrupting their resting, foraging, breeding, etc. Migratory birds will avoid the construction area and nesting birds will leave it. More damaging, however, are the vibrations caused by the movement of heavy duty vehicles, which are a stress factor for both plants and especially for animals, from the lower to the upper classes.

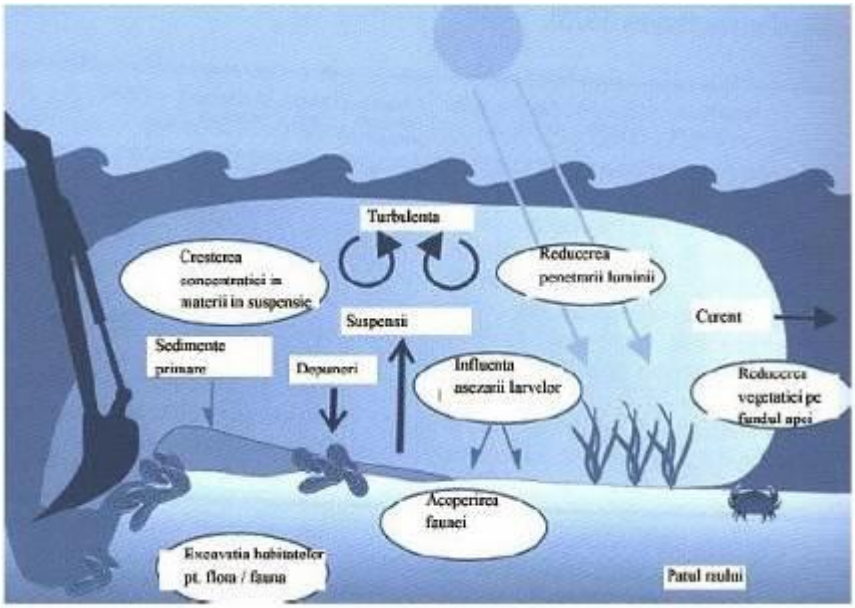
During the construction period, dumpers will be used to transport construction materials or other ancillary products. The literature emphasises that pollutant immissions from road traffic have a negligible effect on vegetation and wildlife, except for lead accumulations. Studies carried out so far show that lead accumulation is insignificant in strips on either side of the road about 50 m wide, with the highest concentration in the first 10 m beside the road.

The construction works to be carried out in the underwater perimeter may have a detrimental influence on the fauna and flora in the site area. Less affected will be larger mobile animals such as fish, amphibians and reptiles, which can leave the disturbed area. A more serious impact will be felt by plants and small animals.

The factor that can cause changes in biological appearance is the flow velocity of water, which influences the shape of organisms and the composition of biocenoses. The project will insignificantly alter the flow velocity in the improved section of the river, with no significant change in the biocenosis composition.

Hydro-technical dredging and embankment works, cutting river meanders can lead to the loss of areas favourable for the reproduction of ichthyofauna, as well as the partial and temporary extirpation of benthic fauna.

The impact of the dredging works is shown schematically in the figure below.



When dredging, the fine particles and dust in the alluvium mass will become suspended, contributing to increased silt charge. Particulate matter can be relocated to the riverbed bottom either by natural deposition or, if they are sufficiently mobile and entrained by the water current, by choosing another deposition site. Organics in the suspended material can absorb available oxygen from the surrounding waters and temporarily create unsuitable living conditions for many aquatic animals. If the suspended sediments are present in high concentrations and persist through extended operations, then the light intensity in the water may be reduced and the photosynthetic processes of algae or other aquatic organisms may be affected.

The dredging works will have a temporary negative impact on benthic species, which inhabit the bottom of the water body, primarily due to the mechanical effect on biocenosis, but also due to the disturbance of the water. The pelitic fraction is made up of mineral and organic substances as well as toxic compounds deposited on the bottom. Locally, in the excavation areas, the excavated material will destroy the biotopes, damaging the biocenoses that inhabit them. Resuspension of the pelitic fraction may cause disturbances in the functioning of biocenosis in adjacent areas. Reducing the amount of light will lead to changes in macrophyte algal populations, reducing the filtering capacity of benthic species (mainly molluscs, which are attached to the substrate), as well as the feeding capacity of some fish species.

Disruption to the normal functioning of the aquatic ecosystem will also be caused by the noise and vibration produced during the dredging works, which will drive away the schools of pelagic fish that pass through the area in search of food. As far as phytoplankton are concerned, during the dredging operation, the physical and hydrological conditions of the water are expected to change: increase in water particulate matter, decrease in light, water turbulence, etc., which will change the quality and quantity of the phytoplankton communities. The dredging will introduce benthic microalgae (microphytobenthos) into the water mass and thus into the phytoplankton composition. For these

reasons, the phytoplankton composition will be significantly enriched in benthic species, mainly diatoms. This will increase the proportion of diatoms in the work zone, particularly in the lower layers of the water mass.

The reduction in light intensity, caused by the suspended solids in the water, will lead to changes in the quality and quantity of phytoplankton and that in the upper layers of the water. Throughout the period of dredging, phytoplankton microalgae will decrease and diatoms will become more dominant.

The impact on phytoplankton during the works will be temporary and the phytoplankton community will return to its previous parameters after a few months.

With regard to phytobenthos, the major effect of dredging is to increase the silt charge of the water, preventing light penetration to the benthic algae, shallowing the depth to which the algae can grow. Fine and coarse particulate matter deposited on the algal thallus will prevent photosynthesis from taking place, leading to the disappearance of primary producers. Suspensions deposited on the growing substrates will prevent the attachment of algae, resulting in reduced phytobenthos. After the cessation of anthropogenic activity and a return to natural turbidity conditions, a recovery of algal stocks can be expected, all the more so as the works are not permanent, but are carried out over a small area.

Changing the bottom surface by displacing a volume of substrate, populated by benthic invertebrate species (polychaetes, molluscs, gastropods and bivalves, crustaceans, etc.), will have negative effects on zooplankton. The plankton is home to the larvae of benthic species (polychaete worm larvae, bivalve and gastropod larvae, etc.). Disturbing (interrupting) the reproductive cycle of benthic species will lead to some decline in their numbers, at least during the period of dredging. The quality structure of zooplankton, i.e. species diversity, will also suffer in terms of a decrease in the number of taxa. The reduction in light, as well as the increase in suspension in the water, will insignificantly alter the quantitative and qualitative structure of phytoplankton organisms (single-celled plant species living in the plankton). As the food source for zooplankton, a decline in the zooplankton food base will indirectly mean a decline in zooplankton organisms. Directly, these conditions can lead to suffocation of microscopic animal organisms, either by clogging their respiratory apparatus (copepods, cladocereans) or by covering their entire body (rotifers). In turn, declines in the numbers of more sensitive species of copepods, cladocereans, etc. may lead to changes in the qualitative and quantitative structure of zooplankton. As free-floating organisms in the water mass, unattached to the substrate, zooplanktonic organisms are able to leave the sites where machinery operate, and to reoccupy these sites after the activity has stopped. They also have short reproductive and life cycles, leading to rapid population recovery from short-term disturbance.

Thus, the negative impact on biodiversity of the hydrological works part of this project is considered to be **moderate**, temporary, manifested by the loss of breeding, feeding and resting habitats - as a result of temporary and permanent modification of the current characteristics of watercourses. It is not currently possible to estimate the degree of long-term negative impact and its reversibility, due to the lack of data needed for such an analysis.

Acoustic stimuli: **a minor impact** has been estimated, as during construction the legal noise limits in the construction site area are respected and wildlife species occasionally present will avoid the construction area.

Emission of pollutants: **a negligible impact** has been estimated, as during construction the legal provisions on pollution are respected, the specific construction activities for the fairway development are not polluting biodiversity in general. The designed works (fillings of granular material - ballast or crushed rock, concrete, revetments, etc.) provide for the use of inert materials, non-hazardous in terms of water and ecosystem pollution. According to the computations performed in section 1.7.1, the pollutant emissions are totally dispersed at a distance of 100 metres from the source.

Light: **there will be no negative impact** during the construction phase as the works will not be carried out at night.

6.6.4.2 Operation period

Migration of aquatic fauna

According to the data presented in point 5.4.1, the number of fish species in the Argeș River is very low, the water quality is moderate, which demonstrates a poor ecological situation and a low current potential for the population of fauna species, both in aquatic and terrestrial, riparian environments.

The project analysed is expected to have a significant overall positive direct and indirect impact on all ecosystems, primarily by improving water quality. This could lead to an increase in specific fish composition.

However, ensuring longitudinal connectivity for the migration of aquatic biodiversity, both vertebrate and invertebrate, remains a controversial and unresolved issue at the time of drafting this documentation.

Thus, the designer considers that the navigable locks in the hydrotechnical nodes will be sufficient to ensure the longitudinal connectivity of the riverbed.

A navigable lock is a hydrotechnical construction which ensures the passage of ships between two successive navigable reaches of different levels by means of a variable level chamber called a *lock chamber*. The lock is located in the section of the drop step at the junction of the two reaches.

The downstream locking operation (Fig. 173) has the following phases:

1. the downstream gates are closed;
2. the lock chamber at the level of the upstream reach is filled;
3. the upstream gates are opened;
4. the ship enters the lock chamber;
5. the upstream gates are closed;
6. the level in the lock chamber lowers to the level of the downstream reach;
7. the downstream gates are opened;
8. the ship exits the lock chamber heading to the port downstream.

The upstream locking operation is analogous.

The gates open when the water level in the lock chamber is equal to the level of the reach to which the vessel is heading. This way, a ship can exit the lock chamber (or enter the lock chamber).

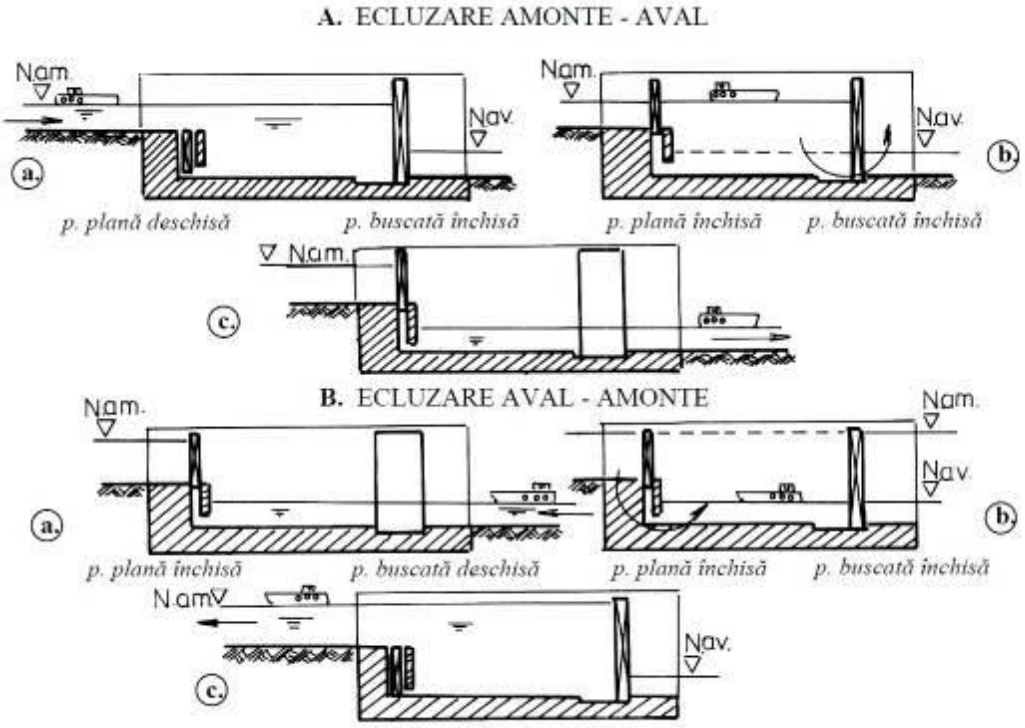


Figure no. 173 - Locking operation
A.- upstream-downstream locking; a.- entry from upstream; b.- emptying; c.- exit downstream; B.- downstream-upstream locking; a.- entry from downstream; b.- filling; c.- exit upstream

Since there are no sites for new structures and any structure to ensure the migration of fish and ichthyological fauna implies the impossibility of realising the functions of the development works, the **designer estimates that the longitudinal continuity of the rivers will be ensured** by the large number of locking operations (20 hours/day).

However, according to bibliographical data, locks and lifts are **only** used **for upstream migration,** while other types of passages require auxiliary equipment to guide ichthyofauna: perforated panels, lights, strobe lights, air curtains, modified grates at water intakes, etc. are used. As these have not proven their effectiveness, it should be noted that, in principle, other hydrotechnical solutions than those used for upstream migration are used for downstream migration (Lucas et Baras, 2001, Schmutz et Mielach, 2013)[21].

Thus, the migration of fish (and other aquatic faunal classes) from upstream to downstream is not ensured, as it presents a **moderate-major negative impact**, difficult to estimate precisely under the given conditions.

This negative impact is also associated with the negative impact of creating retentions. Thus, the flowing regime of the future canal will be modified compared to the current flowing regime in the natural river bed. Taking into account that the manoeuvring of the flaps will aim to keep the discharged flow as close as possible to the influent flow, it can be considered that the **overall negative impact on aquatic ecosystems will be minor.**

Light

In the operational phase, **a negligible impact** on bird population was estimated, as the visual orientation of birds may be disturbed only by the red lights, which are discontinuous, episodic and over a range that is not significant for the local and migratory routes of birdlife. Under the conditions of the project analysed, these lights are activated only when ships approach, and their range is 3-5 km - a negligible distance for homing and migration. Therefore, if a birds' visual sensors are disturbed for the moment, the multitude of other orientation sensors remain active and unaffected.

The illuminated signs placed along the canals will have two-coloured lights: on the right bank - red, on the left bank - green. Figure 174 shows a modelled green signal.



Figure no. 174 - Example of a green signal on a photovoltaic solar panel on a navigable canal

Along the Argeș river, the navigation development works provide for the installation of 45 such two-colour beacons, and along the Dâmbovița river 20 such beacons. They will be placed at equal distances (the exact position will only be established at the *Technical Design* stage). In addition, 1 green light signal will be placed at the entrance to the ports of Oltenița, 1 Decembrie and Glina.

[21] https://dspace.upt.ro/jspui/bitstream/123456789/417/3/BUPT_TD_Molnar%20Paul.pdf

Artificial light sources (such as the light signals placed along the Argeș and Dâmbovița watercourses after the development for navigation) can be considered as sources of environmental light pollution, which affects ecosystems all over the world. Many nocturnal migratory birds die or lose a large amount of energy during their migrations due to the presence of these artificial light sources. This is especially the case in offshore platform areas.

Some research on the subject (Hanneke Poot et al. 2008)[22] have shown that the magnetic compass of birds is wavelength-dependent: migratory birds require light from the blue-green part of the spectrum for magnetic compass orientation, whereas red light (visible long-wavelength) disrupts magnetic orientation The authors found that nocturnal migratory birds were disorientated and attracted to red and white lights (those containing long-wave radiation), while blue and green lights were less disorientating. The situation is especially characteristic during cloudy nights.

However, ornithologists' research into the behavioural and neural mechanisms of migration and homing in birds has shown that they are complex and rely on several orientation abilities, such as acoustic, olfactory, visual and magnetic. In addition to these, there may be other, finer, species-specific mechanisms.

It is precisely this variety of sensors, working together to maximise adaptability, that helps populations survive in harsh environmental conditions. This is important in analysing the impact of visual light signals.

Birds' orientation in space at night is based on several spatial-temporal landmarks. Under the analysed project conditions the visual orientation of individuals will be disturbed by the red light visual signals. However, these lights only activate when ships approach, and their range is 5 km - a negligible distance for homing and migration. Therefore, if a birds' visual sensors are disturbed for the moment, the multitude of other orientation sensors specified above remain active.

The visual orientation of birds can only be disturbed by red lights, which are discontinuous, episodic and over a range that is not relevant for the homing and migration routes of birds. Other orientation skills will not be affected. Thus, the negative impact of the works on the development and operation of the ship traffic signalling system on the two canals can be estimated as **negligible.**

Given that the expected negative impact is insignificant, specific measures to prevent the impact on bird populations in Natura 2000 sites cannot be envisaged, since for optimal conditions for ship traffic, it is imperative to adequately set up the signalling system in the area of the Argeș and Dâmbovița navigable canals (given the provisions of national and international legislation on visual light signals necessary for the movement of river vessels).

Ship traffic

During this period, predicted shipping traffic will not have a significant influence on biodiversity. Only in the aftermath of serious shipping or road accidents (bridges), resulting in fires or loss of hazardous substances, can the biodiversity of the canal be affected. If such an accident occurs right on the bridges, the oil product leaks into the water of the connecting canal and, depending on the quantity, can affect the aquatic environment with all its components.

During operation, the noise emitted by ships will be within legal limits.

In terms of increased intensity of shipping traffic, according to literature studies, mammals and birds avoid open spaces (rivers) for longer distances to avoid infrastructure, compared to wooded areas, which offer reduced visibility. Thus, in the vicinity of a navigable infrastructure, mammals and birds either avoid it or suffer a decrease in population density.

No significant effects of traffic intensity on birds were found. The response to such an impact depends on the species. Predators concentrate near infrastructure while other taxa tend to avoid it. Numerical abundance is affected by distance from infrastructure: within a few metres for small mammals and up to several hundred metres for large mammals.

[22] https://www.researchgate.net/publication/46710280_Green_Light_for_Nocturnally_Migrating_Birds

The impact on fish species will be negligible. In theory, increased traffic intensity could influence fish populations during spawning. In practice, however, the spawning grounds of freshwater fish are at shallower depths than those needed for navigation. The rest of the time individuals will avoid shipping traffic areas.

At the same time, a number of **indirect positive impacts** have been identified **in the operational phase** on biodiversity in general, due to the following aspects:

- stabilisation of the morphological phenomena of modification of the geometry of the minor riverbed and banks, compared to the current situation, where the ballast mining that is present in the project area and that will be cancelled by the project is largely the cause of these phenomena;
- additional development and defence of adjacent floodplains, planned on tributaries, in order to improve the flow regime and their connection to the canal, such as on the Neajlov River, where downstream regularisation is planned up to the confluence with the planned canal on the Argeș River;
- in the area of the hydrotechnical nodes, the rubbish dumps, which have appeared over the last 33 years or so of work stoppages, will be removed;
- clean, renewable electricity generation will lead to a smaller carbon footprint with a positive effect for the whole area, including biodiversity;

A positive impact is expected through the creation of concrete slopes bordering deep flowing waters with low risk of freezing, thus creating an artificialized habitat with beneficial influences for many species. Many of the migrating waders will be able to use the concreted area near the water to move around in search of food sources made up of a range of small, floating invertebrates.

Overall, the proposed works, by their nature, will contribute to the stability of the embankments by reinforcing them, thus constituting a safety element, including for biodiversity.

There will be no changes to the soil or subsoil during operation. The creation of a regularised area with well-contoured slopes will allow the area to be ideally hygienised so that possible incidents related to the presence of litter, plastic bags and bottles on wildlife, especially birds, will be eliminated.

6.6.4.1 Sensitivity class

As stated above, the land to be permanently occupied by the works that are the subject of this project is agricultural land, land intended for buildings and adjoining areas, forest, non-agricultural land in different areas for each of the three counties where the project will be located. However, there are areas where biodiversity may be **moderately** affected, regardless of prevention/reduction measures.

Thus, in terms of biodiversity sensitivity class (as presented in Chapter 7), the area where the works are located falls under the **moderate** sensitivity zone.

6.6.4.2 Extending the impact

During the execution of the works, the impact will be felt **locally**, exclusively in the area where the works are being carried out and in the immediate vicinity of the works.

6.6.4.3 Magnitude and complexity of the impact

The magnitude of the impact is **medium** and of **medium complexity**, manifesting itself both during the period of works in the project areas or in their immediate vicinity, and during the first years of operation, until the restoration of appropriate conditions of vegetation adjacent to the banks and the restoration of the river ecosystem.

6.6.4.4 Likelihood of impact

During the works, the impact on biodiversity is very likely to be widespread throughout the project area and in areas of ecological connectivity.

6.6.4.5 Duration, frequency and reversibility of impact

The impact on biodiversity will be felt in the short and medium term, both during the works in the project areas or in their immediate vicinity and during the first years of operation, until the appropriate conditions of vegetation adjacent to the banks and the restoration of the river ecosystem are restored. The impact will be **reversible** with a **positive** value in the next 2 years of operation, provided that the measures to prevent/reduce the impact are respected. The frequency of impact occurrence will be high during the construction period and low, diffuse during operation in the early years.

6.6.4.6 Findings of the Appropriate Assessment study

The project crosses or is in the immediate vicinity of 3 PNACIs: ROSAC0043 Comana, ROSPA0022 Comana and ROSPA0038 Danube-Oltenița.

4 PNACIs are 1-4 km away: ROSCI0308 Cemica Lake and Forest, ROSPA0122 Cernica Lake and Forest, ROSAC0131 Oltenița-Mostiștea-Chiciu, ROSPA0136 Oltenița - Ulmeni.

Following the field investigations, the following species of conservation importance were found:

1. ROSAC0043 Comana - a species of mammal, 1324 *Myotis myotis*

2. ROSPA0022 Comana - 21 bird species:

    1. A298 *Acrocephalus arundinaceus*
    2. A056 *Anas clypeata*
    3. A364 *Carduelis carduelis*
    4. A081 *Circus aeruginosus*
    5. A208 *Columba palumbus*
    6. A212 *Cuculus canorus*
    7. A253 *Delichon urbica*
    8. A269 *Erithacus rubecula*
    9. A359 *Fringilla coelebs*
    10. A251 *Hirundo rustica*
    11. A271 *Luscinia megarhynchos*
    12. A230 *Merops apiaster*
    13. A746 *Miliaria calandra (Emberiza calandra)*
    14. A319 *Muscicapa striata*
    15. A337 *Oriolus oriolus*
    16. A017 *Phalacrocorax carbo*
    17. A393 *Phalacrocorax pygmeus*
    18. A274 *Phoenicurus phoenicurus*
    19. A315 *Phylloscopus collybita*
    20. A311 *Sylvia atricapilla*
    21. A283 *Turdus merula*

3. ROSPA0038 Danube-Oltenița – 24 bird species:

    1. A053 *Anas platyrhynchos*
    2. A028 *Ardea cinerea*
    3. A364 *Carduelis carduelis*
    4. A031 *Ciconia ciconia*
    5. A212 *Cuculus canorus*
    6. A036 *Cygnus olor*
    7. A253 *Delichon urbica*
    8. A026 *Egretta garzetta*
    9. A269 *Erithacus rubecula*

10. A359 *Fringilla coelebs*
11. A125 *Fulica atra*
12. A251 *Hirundo rustica*
13. A459 *Larus cachinnans*
14. A179 *Larus ridibundus*
15. A230 *Merops apiaster*
16. A746 *Miliaria calandra*
17. A262 *Motacilla alba*
18. A337 *Oriolus oriolus*
19. A017 *Phalacrocorax carbo*
20. A393 *Phalacrocorax pygmeus*
21. A315 *Phylloscopus collybita*
22. A351 *Sturnus vulgaris*
23. A283 *Turdus merula*
24. A232 *Upupa epops*

4. ROSCI0308 Cernica Lake and Forest - no habitat or species

5. ROSPA0122 Cernica Lake and Forest – 5 bird species:

1. A060 *Aythya nyroca*
2. A179 *Larus ridibundus*
3. A393 *Phalacrocorax pygmeus*
4. A193 *Sterna hirundo*
5. A338 *Lanius collurio*

6. ROSAC0131 Oltenița-Mostiștea-Chiciu - no habitat or species

7. ROSPA0136 Oltenița – Ulmeni – 2 bird species:

1. A231 *Coracias garrulus*
2. A179 *Larus ridibundus*

In the vicinity of the works, the following species of Community importance from the standard forms of the 7 Natura 2000 sites have been confirmed:

36 bird species from the list of species in the standard forms of the 4 PNACIs - ROSPA0022 Comana, ROSPA0038 Dunăre-Oltenița, ROSPA0122 Cernica Lake and Forest and ROSPA0136 Oltenița - Ulmeni:

1. *A298 Acrocephalus arundinaceus*
2. *A056 Anas clypeata*
3. *A053 Anas platyrhynchos*
4. *A028 Ardea cinerea*
5. *A060 Aythya nyroca*
6. *A364 Carduelis carduelis*
7. *A031 Ciconia ciconia*
8. *A081 Circus aeruginosus*
9. *A208 Columba palumbus*
10. *A231 Coracias garrulus*
11. *A212 Cuculus canorus*
12. *A036 Cygnus olor*
13. *A253 Delichon urbica*
14. *A026 Egretta garzetta*
15. *A269 Erithacus rubecula*
16. *A125 Fulica atra*
17. *A359 Fringilla coelebs*
18. *A251 Hirundo rustica*
19. *A338 Lanius collurio*
20. *A459 Larus cachinnans*
21. *A179 Larus ridibundus*

22. *A271 Luscinia megarhynchos*
23. *A230 Merops apiaster*
24. *A746 Miliaria calandra (Emberiza calandra)*
25. *A262 Motacilla alba*
26. *A319 Muscicapa striata*
27. *A337 Oriolus oriolus*
28. *A017 Phalacrocorax carbo*
29. *A393 Phalacrocorax pygmeus*
30. *A274 Phoenicurus phoenicurus*
31. *A315 Phylloscopus collybita*
32. *A193 Sterna hirundo*
33. *A351 Sturnus vulgaris*
34. *A311 Sylvia atricapilla*
35. *A283 Turdus merula*
36. *A232 Upupa epops*

- 1 mammal species: 1324 *Myotis myotis* - from ROSAC0043 Comana

According to the matrix calculation, the **potential direct and indirect negative impact** of the project on bird populations and on the mammal *Myotis myotis* in Natura 2000 sites, without taking into account preventive measures, are **insignificant, with a value of "1".** The populations of those species are widely distributed, non-specific, occur in various project and non-project areas in the study area, and are adapted to permanent anthropogenic impacts.

According to the analysis of the Assessment Tables based on the documents issued by the National Agency for Protected Natural Areas (ANANP), the Management Plans, field data, other relevant sources, as well as expert opinion, **no potential negative impacts of the project on any of the parameters of habitats and species** of conservation interest in the 7 PNACIs analysed **were identified**.

Detailed analyses have been prepared for the 3 potentially affected PNACIs: ROSAC0043 Comana, ROSPA0022 Comana and ROSPA0038 Dunăre-Oltenița, located on the Argeș River.

Given the distances of more than 1.3 km from the other 4 analysed PNACIs on the Argeș and Dâmbovița rivers and the fact that no negative effects and impacts of the project on them were identified, a detailed analysis was considered redundant.

Thus, the biodiversity of conservation importance in the 3 PNACIs **may be insignificantly affected by the project activities and their impacts.** Although no species or parameter affected by the planned works has been found, the effects of the project and their impact on ecosystems in general and consequently on biodiversity of Community importance and biodiversity of non-conservation importance in particular have been taken into account in accordance with the precautionary principle.

The conclusions were issued on the basis of the following project outcomes:

1. *Land take:* **an insignificant negative impact** has been estimated, as it is already largely occupied by existing buildings, the additional area to be occupied by the projected works is a construction-intended area and is negligible compared to the area of the PNACIs: **0.0012% of ROSAC0043 Comana, 0.0013% of ROSPA0022 Comana and 0.015% of ROSPA0038 Dunăre-Oltenița.** The area does not provide the specific essential habitats required by faunal species of conservation importance, and is only occasionally utilised by certain bird species in passage.

2. *Direct vegetation change:* **an insignificant negative impact** was estimated **during the construction phase**, as the planned deforestation refers to the removal of vegetation that has grown over the existing built structures during the abandonment of the construction site, as well as the area adjacent to the project, which is heavily anthropized, representing anthropogenic, non-productive and riparian biomass, characterised by predominantly invasive, ruderal, common shrub species and not including habitats of conservation importance, which are absent from the project area. The area does not provide necessary habitats for faunal species of conservation importance, no specific breeding

sites were found during the field investigations within the perimeter of deforestation.

3. *Inadequate biodiversity management:* **an insignificant negative impact** has been estimated **during the construction phase**, as the area is anthropized, occupied by buildings in various stages of degradation, occasionally porting biodiversity elements of conservation importance and therefore its careful and appropriate management is recommended.

A positive impact is expected through the creation of concrete slopes bordering deep flowing waters with low risk of freezing, thus creating an artificialized habitat with beneficial influences for many species. Many of the migrating waders will be able to use the concreted area near the water to move around in search of food sources made up of a range of small, floating invertebrates.

4. Modification of the soil or subsoil: **an insignificant negative impact** was estimated **during the construction phase**, as the area is degraded and heavily anthropized, biodiversity elements of conservation importance will not be affected during the works to be carried out on the soil and subsoil.

5.-7. *Modification of morphological, hydrological, hydrodynamic, hydrochemical conditions:* **an indirect insignificant negative indirect impact** on biodiversity of conservation importance was estimated **during the construction phase** for the development of the Argeș river course.

At the same time, a number of **indirect positive impacts** on biodiversity of conservation importance have been identified **during the operational phase**.

8. *Temperature change:* **a non-significant negative impact** was estimated **during the construction phase**, due to the activities on the site. No negative impact is expected during operation, as the average temperature regime will be maintained thanks to the locks. This solution is beneficial for wildlife species that will be able to use the area for foraging and shelter (especially bird species that occasionally winter in the area).

9. *Change in other factors relevant to the location, in particular climatic factors:* there will be no negative impact.

10. *Mortality:* **an insignificant negative impact** was estimated **during the construction phase**, as bird species of conservation importance only occasionally use the area for resting and foraging in passage, without being directly impacted by the works. No birdlife collisions are expected with the vessels that will be travelling during the operation, as their navigation speed will be reduced. Rare, incidental mortalities are expected for biodiversity in general, specific to the anthropogenic impacts manifested in the project areas.

11. *Acoustic stimuli*: **an insignificant negative impact** was estimated, as during construction the legal noise limits in the construction area are respected, noise will not propagate into the PNACIs, and bird species occasionally present will avoid the construction area. During operation, the noise emitted by ships will be within legal limits.

12. *Shocks or vibrations*: **an insignificant negative impact** was estimated, as the area is anthropized, occupied by buildings in various stages of degradation, with biodiversity elements of conservation importance occasionally present, but not directly affected.

13. Optical stimuli: **there will be no negative impact** - no sources disturbing biodiversity have been identified.

14. *Light:* **there will be no negative impact** during the construction phase as the works will not be carried out at night.

An insignificant negative impact on bird population was estimated in the operational phase, as the visual orientation of birds may only be disturbed by the red lights, which are discontinuous, episodic and over a range that is not significant for the local and migratory routes of birdlife.

15. *Emissions of pollutants*: **an insignificant negative impact** has been estimated, as during construction the legal provisions on pollution are respected, the specific construction activities for the fairway development are not polluting biodiversity in general.

16. *Spread of invasive species:* **an insignificant negative impact** has been estimated, as plant communities in the project area are strongly affected by the presence of invasive species.

Because in the neighbourhood and intersection areas of the project with the 3 relevant PNACIs: ROSAC0043 Comana, ROSPA0022 Comana and ROSPA0038 Dunăre-Oltenița no other projects whose scale will lead to a cumulative negative impact are implemented, no relevant pressures/threats have been identified in the management plans of the sites that could be cumulated with the project, except for deforestation, which has an insignificant negative impact, it will be of the same magnitude as the singular impact.

As a result, the following **significant positive cumulative impact in the long term** is found:

- maintaining a **favourable conservation status of the habitats and faunal populations of Community interest** for which Natura 2000 sites have been designated, without changes in the dynamics and structure of the habitats and faunal populations identified;
- maintaining territorial size, shelter, resting, feeding, rearing, hibernation areas;
- improving surface water quality;
- greening the area.

In the **short term**, the following types of impacts are expected:

- the project will have a ***negligible negative impact on the integrity of the sites,*** as the habitats in the project area are heavily anthropized, most of the works will be outside the community sites, except for a few areas that are on the periphery of the sites, with a small degree of extensions and/or developments within the 3 PNACIs, compared to the total area of Natura 2000 sites. The land for the project is already largely occupied by existing buildings, the additional area that will be occupied by the projected works is a construction area, and is negligible compared to the area of the 3 PNACIs: **0.0012% of ROSAC0043 Comana, 0.0013% of ROSPA0022 Comana and 0.015% of ROSPA0038 Dunăre-Oltenița.**
- the dynamics and structure of the faunal populations present in the area of the works will not be affected, and the negative impact on habitat conditions will be ***insignificantly negative***. The conservation parameters of species of Community importance in the analysed sites will not be affected. The area does not provide the specific essential habitats required by fauna species of conservation importance, and is only occasionally used by certain bird species in passage for resting and feeding. No breeding sites or migratory colonies of bird species were reported during the field investigations.

In the **medium and long term**, ***a significant positive impact*** is expected to occur due to increased quality and rational management of surface waters, partial de-pollution of aquatic and terrestrial ecosystems in the area and an improvement in the conservation status of Natura 2000 sites.

The negative direct impact is insignificant in the short term (-1) during construction and development works and will become positive, +12 points in the medium term, and +15 in the long term - significantly positive in the operational period.

Table 51 summarises the findings of the Appropriate Assessment study.

Table no. 51 - Conclusions of the Appropriate Assessment study

Description of project components	The **navigable waterway** - has a length of 73 km on the Argeș river and takes up a difference in level of 53 m through 4 hydrotechnical nodes (HNs), and on the Dâmbovița river a length of 31 km with a difference in level of 14.60 m, taken up by 2 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and 40.0 m on the Dâmbovița river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.

	The control works on the lower course of the Argeş River for navigation consist of levelling the river in plane in order to allow the access of convoys formed by a barge and the corresponding pusher, as well as its levelling and its sectioning by 4 steps that take over the difference in level of about 53 m between the Argeș water level in the area of the port of Bucharest and the confluence with the Danube. Dam steps are designed in the form of hydrotechnical nodes located as follows: - hydrotechnical node HN 1 of Oltenița - ensures the linking to the Danube levels - hydrotechnical node HN 2 of Budești - immediately upstream of the current confluence Dâmbovița - Argeș - hydrotechnical node HN 3 of Colibași - upstream the confluence Neajlov - Argeș - hydrotechnical node HN 4 of Copăceni/Varlam The works to make the Dâmbovița river navigable are aimed at canalising, damming and diverting the river's course in the sector between the road bridge crossing the river at Glina and its confluence with the Argeș river at Budești Two hydrotechnical nodes have been designed on the Dâmbovița river: HN 1 of Cucuieți, HN2 of Tânganu. The navigable fairway of the Dâmbovița river separates from the Argeș canal, which is located immediately upstream of the lock's outport in the hydrotechnical node HN2 of Budești (km 29+710). Three operational ports have been designed along the Argeș and Dâmbovița rivers subject to control works: - two ports related to the capital - one in the south-west of the municipality - on the Argeș river, called Bucharest - 1 Decembrie and another in the south-east, on the Dâmbovița river, called Bucharest - Glina; - the port of Oltenița, situated at the confluence of the Argeș and Danube rivers. **The main objectives expected** to be achieved by implementing the investment are the following: ✓ **navigation** - linking Bucharest with the Danube ensures direct access to the port of Constanța, to the main cities along the Danube, as well as to the European inland waterway network; ✓ **flood defence** - for 11 localities, 9,800 households, approx. 50.000 ha of land, 378 km of roads, 5 km of railway and 126 socio-economic objectives; ✓ **water supply and irrigation** - to neighbouring localities, irrigation of approx. 50 thousand ha., dewatering of approx. 30 thousand ha, production of electricity - 126 GWh/year, as well as fish farms on 1,250 ha; ✓ **social benefits** - by providing conditions in the area for: the development of related objectives and activities, the creation of logistic zones and industrial parks, the increase of the economic potential of the neighbouring localities, including job creation and the absorption of unemployment.
PNACIs affected	The project crosses or is in the immediate vicinity of 3 PNACIs: ROSAC0043 Comana, ROSPA0022 Comana and ROSPA0038 Danube-Oltenița. 4 PNACIs are 1-4 km away: ROSCI0308 Cemica Lake and Forest, ROSPA0122 Cernica Lake and Forest, ROSAC0131 Oltenița-Mostiștea-Chiciu, ROSPA0136 Oltenița - Ulmeni. Detailed analyses have been prepared for the 3 potentially affected PNACIs: ROSAC0043 Comana, ROSPA0022 Comana and ROSPA0038 Dunăre-Oltenița, located on the Argeș River.
Habitats/species affected	No affected habitats or species were identified.
Conservation objectives/parameters affected	No conservation targets/impacted parameters were identified.
Impact types, including cumulative impact	The effects of the project will have a **insignificantly negative direct, indirect and cumulative short-term singular impact on the 3 intersecting and neighbouring PNACIs** and a **significantly positive direct, indirect and cumulative medium**

	and long term singular impact on the 3 intersecting and neighbouring PNACIs.
Mitigation measures	Not applicable. No significant negative impacts on PNACIs have been identified
Residual impact	Not applicable
The chosen alternative solution	Not applicable
Imperative reasons of overriding public interest	Not applicable
Compensatory measures	Not applicable
Other aspects	10 prevention measures and a timetable for their implementation were recommended.

6.6.5. The landscape

It is considered that the area where the project will be implemented has a **high sensitivity** in terms of landscape as it is characterised by areas with a high degree of naturalness and/or dominated by landscape elements with traditional characteristics, which preserve the distinctive character of an area with no anthropogenic structures.

Construction period

The temporary works foreseen in the project have a **moderate** temporary negative impact on the landscape. The main elements impacting on the landscape at this stage are the presence of work zones, site organisations, heavy machinery and vehicles. These elements can have a negative visual impact by changing the perception of the landscape by the human population and by emphasising elements characteristic of construction sites.

Operation period

The construction works will lead to a long-term change in the landscape by introducing new elements related to the enlargement of the water surface, but the landscape elements characteristic of the Natura 2000 sites in the project area will be preserved, which is the purpose of implementing bio-engineering techniques and of preserving and conserving the elements for which Natura 2000 sites have been designated. In terms of magnitude of change, the change is considered to be **small.**

Urban wetlands or wetlands near cities can create aesthetic value to the area, especially where areas have been industrialised and contaminated in the past.

In the section on the presentation of the current state of the environment, in *Chapter 4.6 Landscape*, the assessment features of landscape fragmentation by anthropogenic structures consisting of roads/motorways or other anthropogenic structures were also considered. From this point of view, as the character and landscape aspects characteristic of the project area will be preserved, there will be no fragmentation of the landscape.

A **moderate** temporary impact is expected only during the construction phase.

Field surveys revealed an anthropized landscape in the project area, with fragmented bridges, roads, railways, quarries, constructions, illegal landfills, spontaneous undeveloped areas for recreation and hunting.

6.6.5.1 Impact assessment

Considering the type of works proposed for execution, the locations proposed for the site organisation, the duration of execution of the works corroborated with the fact that these works will be executed in stages, as the area where the original buildings demarcated in the previous phases of the project currently exist and will be rehabilitated and/or demolished and rebuilt according to the current project specifications, the area will be cleared of waste and vegetation, the estimated impact during the execution of the works is expected to be **moderate**.

During the operational period, under normal operating conditions, the estimated impact on the landscape is **positive** (through landscape improvements to the area neighbouring the two watercourses).

However, the area where it is proposed to develop the hydrotechnical node of Cucuieți is occupied by forest, and it will be cleared, since a site organisation and a storage pit for dredged material are planned on that location. These works will affect the landscape, generating a **major** impact on the population / residents of the residential complex located in the area neighbouring the project site by changing the area from a green area to an area with buildings, intended for the hydrotechnical node, but especially for the storage of dredged material.

This form of major impact is estimated to be generated both during the execution of the works and especially during the operation of the objective.

Thus, a **major negative impact** is expected on the residential complex "Liziera de Lac", which is under development, as well as on the Tătaru forest and Lake.

6.6.5.2 Sensitivity class

As stated above, the land to be permanently occupied by the works that are the subject of this project is agricultural land, land intended for buildings and adjoining areas, forest, unproductive land in different areas for each of the three counties where the project will be located.

Thus, in terms of sensitivity class (as presented in chap. 7), the area where the works are located falls under a **moderate** sensitivity zone.

6.6.5.3 Extending the impact

During the execution of the works, the impact will be felt exclusively in the area where the works are being carried out and in the immediate vicinity of the works.

6.6.5.4 Magnitude and complexity of the impact

The magnitude of the impact is small and of **low** complexity, manifesting itself only during the works, in the areas affected by the project or in their immediate vicinity, **except in the area where the population of the residential complex "Liziera de Lac" will be affected, where the magnitude will be of major significance.**

6.6.5.5 Likelihood of impact

During the execution of the works, the impact on the landscape will be limited to the areas where the works will be carried out or in their immediate vicinity.

6.6.5.6 Duration, frequency and reversibility of impact

The impact on the landscape will only occur for the duration of the works, the land will be restored to its original state, where this is foreseen in the project. The exception will be the area neighbouring the HN of Cucuieți, where the impact will be felt permanently after the works are completed (during the operational period).

6.6.6. Population

The works proposed to be executed under the project will have an impact on the following localities:

- On the territory of Ilfov County, 8 TAUs are crossed by the works: Vidra, 1 Decembrie, Copăceni, Dărăști, Măgurele, Cornetu, Cernica and Glina.
- On the territory of Călărași county, 13 TAUs are crossed by the works: Budești, Chirnogi, Crivăț, Curcani, Frumușani, Fundeni, Gălbinași, Mitreni, Oltenița, Plătărești, Radovanu, Șoldanu, Vasilați.

- On the territory of Giurgiu county, 9 TAUs are crossed by the works: Adunații Copăceni, Colibași, Comana, Gostinari, Isvoarele, Herești, Hotarele, Mihăilești, Valea Dragului.

6.6.6.1 Sources and pollutants generated during the execution of the works

The proposed works will involve heavy duty traffic for the transport of materials and/or waste, using existing access roads. These roads will cross or are already located close to inhabited areas. The works will generate emissions of particulate matter, noxious emissions from exhaust gases, increased noise and vibration levels.

The work carried out at the work zones also generates emissions of dust, exhaust fumes, noise and vibration.

During the works, the population in the riverside areas could be affected in the short term (duration of the works) by sources of air pollution and higher noise levels.

Another form of impact felt by the population in the riverside areas is that due to expropriation, temporary and/or definitive occupation of land.

The situation in Călărași county, for each TAU, with the areas of land definitively occupied by the project and the current land uses, is given in Annex no. 3 to this report.

Also, through the implementation of the project, there will be an improvement in the social area through the creation of new jobs, both during the implementation of the project and afterwards, during the operation period.

Increased shipping traffic on the two rivers, port development will provide new jobs in the ports and related port services. Achievement of this objective will have the effect of attracting existing local resources into the economic circuit and exploiting them, by using local labour. For economic operators using waterborne transport and port services, the lower costs of waterborne transport (2-3 times lower than road transport and equivalent to rail transport) will contribute to lower prices for products delivered to the beneficiary's door and increase the competitiveness of these operators.

In perspective, all these activities for the population will have both economic and social benefits for the people living in the riverside areas as well as for those in other areas.

During the execution of the works, the number of jobs in the area will increase, which is an important social and human factor with the prospect of increasing the number of jobs after the works are completed.

The sources that can generate an impact on the social factor are also mentioned in the other chapters of this study, considering that motor traffic, handling of pulverised material, operation of concrete/asphalt mixing plants, demolition works, temporary and/or permanent occupation of land, change of land use, etc. can have negative effects on the social factor.

6.6.6.2 Sources of pollution during operation

During the operation of the objective, there will be a positive impact on the social factor in the areas neighbouring the site, by means of:

- ✓ flood defence - 11 localities, 9,800 households, approx. 50.000 ha of land, 378 km of roads, 5 km of railway and 126 socio-economic objectives;
- ✓ water supply and irrigation - to neighbouring localities, irrigation of approx. 50 thousand ha., dewatering of approx. 30 thousand ha, production of electricity - 126 GWh/year, as well as fish farms on 1,250 ha;
- ✓ in the hydroelectric power plants built in the hydrotechnical nodes on the lower Argeș river, about 58 KWh/year of electricity will be produced annually, to which 15 GWh/year of electricity will be added, i.e. the energy produced in the hydrotechnical nodes of Tânganu and Cucuieți on the Dâmbovița river;
- ✓ the possibility to realise fish-farms on up to 1,250 ha;

- ✓ favourable conditions for the development of recreation and tourism activities in the area;
- ✓ favourable ecological influences, given that the water transport alternative is less polluting than the other modes of transport, as well as the fact that, by creating an important water body of about 3,000 ha, plus almost 1,000 ha on the Dâmbovița, in an area with a rainfall deficit, it leads to positive influences on the microclimate.

Likewise, in the other chapters of the report, the sources of damage to the social factor during the period of operation of the objectives analysed have been mentioned.

6.6.6.1 Impact assessment

Considering the type of works proposed for execution, the locations proposed for the site organisation, the duration of execution of the works corroborated with the fact that these works will be executed in stages, as the area where the original buildings demarcated in the previous phases of the project currently exist and will be rehabilitated and/or demolished and rebuilt according to the current project specifications, the area will be cleared of waste and vegetation, the estimated impact during the execution of the works is expected to be **moderate**.

During the operational period, under normal operating conditions, the estimated impact on the landscape is **positive** (through landscape improvements to the area neighbouring the two watercourses).

However, as regards HN of Cucuieți, a **major negative impact** is expected on the residential complex "Liziera de Lac", which is under development, as well as on the Tătaru forest and Lake.

6.6.6.1 Sensitivity class

As stated above, the land to be permanently occupied by the works that are the subject of this project is agricultural land, land intended for buildings and adjoining areas, forest, non-agricultural land in different areas for each of the three counties where the project will be located.
Thus, in terms of sensitivity class (as presented in Chapter 7), the area where the works are located falls under the **moderate** sensitivity zone.

6.6.6.2 Extending the impact

During the execution of the works, the impact will be felt exclusively in the area where the works are being carried out and in the immediate vicinity of the works.

6.6.6.3 Magnitude and complexity of the impact

The magnitude of the impact is small and of **low** complexity, manifesting itself only during the works, in the areas affected by the project or in their immediate vicinity, **except in the area where the population of the residential complex of Tătaru (Plătărești) will be affected, where the magnitude will be of major significance**

6.6.6.4 Likelihood of impact

During the execution of the works, the impact on the soil will be limited to the areas where the works will be carried out or in their immediate vicinity.

6.6.6.5 Duration, frequency and reversibility of impact

The impact on the population will occur only for the duration of the works, after their completion the land will be restored to its original state, where this is foreseen in the project. The exception will be the area neighbouring the HN of Cucuieți, where the impact will be felt permanently after the works are completed (during the operational period).

6.6.7. Material assets, natural resources

6.6.7.1 Location of the project and the impact on material assets

In accordance with the legal provisions in force, for the execution of the planned works, no materials or natural resources will be exploited within or in the immediate vicinity of the natural areas included in the Natura 2000 European ecological network. The procurement of materials will be done gradually, in each stage of construction, so that they can be put into operation and avoid long-term stockpiling of materials.

As mentioned above, the project site is located in three counties: Giurgiu, Călărași and Ilfov, and in several TAUs. The description of the site can be found in chapter *2.2 Location of the project.*

On the site of the objective, at this time there are a number of construction structures demarcated during the previous period, when this project was initiated. Expert studies were carried out on these structures in order to see the level of degradation and whether they need to be demolished or not. These buildings are part of the project and are not assets belonging to other entities.

In order to complete the project it will be necessary to occupy certain areas of land, both on a permanent and temporary basis, as presented in the previous chapters. Expropriations will be made for these definitive land occupations. Forest clearing works will also be necessary to clean up the site and to clear it for the necessary operations, as designed.

All these constitute a source of negative impact on the social factor and its assets, for which prevention/mitigation measures are proposed in the following chapters.

6.6.7.2 Land occupation

To implement this project, given its scale and complexity, it will be necessary to occupy certain areas of land.

According to the data provided by the designer, the land areas occupied for this project have different land uses, namely:

- In Giurgiu County, a total of 8,675,917 square metres of land will be occupied for the control works on the Argeș river, of which:
    - agricultural land - 250,517 square metres
    - land intended for buildings and adjoining areas - 1,099,149 square metres
    - forest land - 349,154 square metres
    - non-agricultural land - 6,947,098 square metres
- In Ilfov County, a total of 3,775,278 square metres of land will be occupied for the control works on the Argeș River, of which:
    - agricultural land - 423,317 square metres
    - land intended for buildings and adjoining areas - 628,826 square metres
    - forest land - 135,403 square metres
    - non-agricultural land - 2,587,732 square metres
- In Călărași County, a total of 15,109,550 square metres of land will be occupied for the control works on the Argeș river, of which:
    - agricultural land - 3,089,625 square metres
    - land intended for buildings and adjoining areas - 1,856,335 square metres
    - forest land - 1,185,135 square metres
    - non-agricultural land - 8,339,352 square metres.

Attached to this study is the presentation of the areas of land occupied by this project for each category and by TAUs (according to Annex no.7).

6.7 Impact in a cross-border context

The site of the works is located on the Argeș river, downstream of the Mihăilești - Cornetu lake and on the Dâmbovița river, downstream of the bridge on the Bucharest ring road, in the counties of Ilfov, Giurgiu and Călărași.

The proposed project includes control works on the Argeș and Dâmbovița rivers for navigation and other uses in accordance with Romanian and EU standards and regulations. The navigable waterway - has a length of 73 km on the Argeș river and takes up a difference in level of 53 m through 4 hydrotechnical nodes (HNs), and on the Dâmbovița river a length of 31 km with a difference in level of 14.60 m, taken up by 2 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and 40.0 m on the Dâmbovița river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.

At present, the land related to the objective is located mainly on the public domain of the State and partly on the private domain of the residents.

The distance to the Bulgarian bank of the Danube from the port of Oltenița area, where the works are planned, is about 1,300 km (Fig. 175).





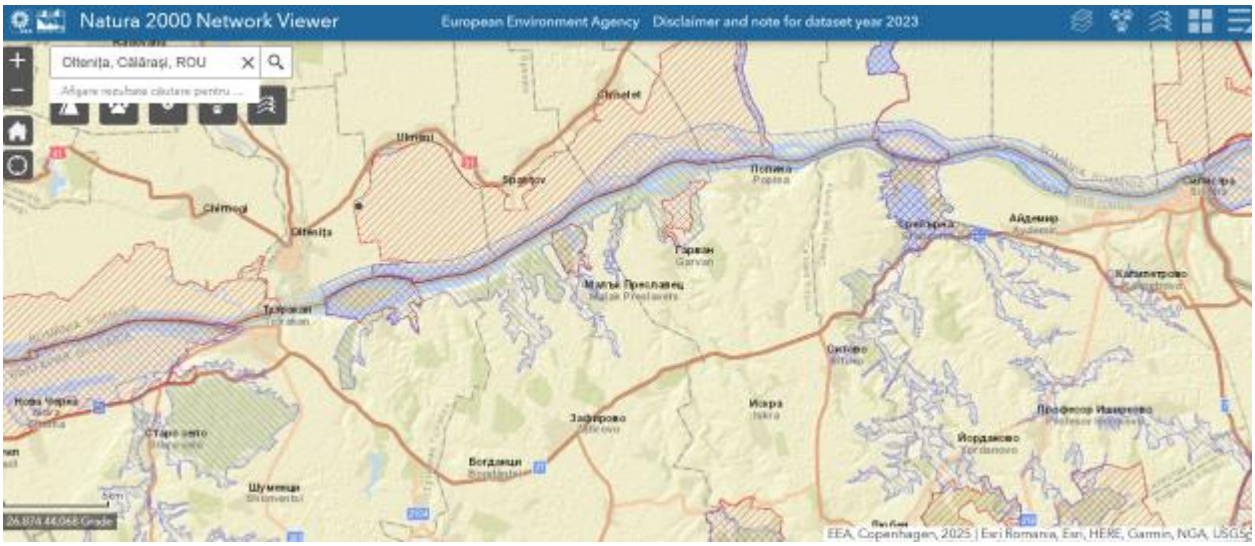


Figure no. 175 - Geographical location of the project in the area of the Argeș-Danube confluence in relation to Bulgaria and Natura 2000 sites

The project under review falls under the Convention on Environmental Impact Assessment in a Transboundary Context, signed at Espoo on 25 February 1991, ratified by Law No. 22/2001, as subsequently amended.

The potentially negative environmental effects associated with the construction and operation of the Argeș and Dâmbovița rivers may be the following:

- biodiversity loss,
- atmospheric emissions,
- soil and water pollution,
- traffic noise,
- erosion,
- changes in the morphology of watercourses,
- landscape damage.

The relevant area of the Bulgarian side of the Danube River includes the following NATURA 2000 sites:

1. *Ostrov Pozharevo, code BG0000237;*
2. *Kompleks Kalimok, code BG0002030;*
3. *Blato Malak Preslavets, code BG0002065;*
4. *Garvansko Blato, cod BG0002064;*
5. *Ostrov Chayka, code BG0000534;*
6. *Kalimok-Brashlen, code BG0000377;*
7. *Pozharevo-Garvan, code BG0000530.*

Since, according to the conclusions of the Appropriate Assessment, the project may have **at most insignificant negative impacts** on Natura 2000 sites on the Romanian territory, we estimate that **there will be no negative impact** on the sites in Bulgaria, given the distance and morphology of the Danube river.

Therefore, we consider it redundant to analyse the Natura 2000 sites on the Bulgarian territory in the context of the project under review.

The works proposed by this project in the port of Oltenița area (described in chap. 2.3.2.3.2 Port of Oltenița) **will not affect the water quality of the water body shared with the Bulgarian area** (Danube River), as they will be carried out based on a phased approach, for a short duration and in a limited area near the shore, while the opening of the port of Oltenița area, which is the subject of this project, is located on the Argeș River.

As the impact on the quantitative and qualitative regime of surface and groundwater in the Romanian area during the execution of the works is **moderate**, limited to the works execution area, the project

cannot affect the water bodies located on the Bulgarian territory.

During the operating period of the project, the estimated impact on the quantitative and qualitative regime of surface and groundwater in the Romanian area is **minor, and no negative impact is expected for the Bulgarian area.**

Also, since the dredging works currently being carried out for the operation of the port of Oltenița are of a minor scale, similar to those in the project, we estimate that the impact during the project execution period will not be greater than that expected during normal periods of port operation (both in Romania and Bulgaria).

As regards the emissions of particulate matter resulting from the handling of the material used in the execution of the works or the waste resulting from demolition works, according to the analysis in the previous chapters, given the location of the Port of Oltenița (opening towards the Argeș River and not towards the Danube River on the border between Romania and Bulgaria), the effect is local, manifested over short periods of time (only during the execution period) and only in case of failure to comply with the measures provided for in this report.

The construction works and associated traffic will not lead to a significant increase in noxious emissions affecting the Bulgarian area. In addition, the distance of 1300 m from the construction site to the neighbouring shore significantly reduces the concentrations of noxious emissions, so there will be no negative cross-border impact, and the population of the Bulgarian town of Tutrakan will not be affected.

In the event of an accident / natural disaster on the Romanian side in any of the objectives of this project, involving emissions of particulate matter or noxious emissions into the atmosphere, high noise levels or pollution of surface water bodies (Dâmbovița River and/or Argeș River), given the distance of at least 1.3 km from the last objective (the port of Oltenița) to the nearest point on the Bulgarian shore, the effects will have an insignificant negative impact on the population, material assets and/or environmental factors in the Tutrakan area of Bulgaria.

As the implementation of the project requires the use of a wide range of equipment, machinery and heavy duty vehicles, which generate noise and vibrations, the residential areas on the Romanian side of the river may be affected. Due to the distance of about 1 km from the last objective on the Romanian side to the Bulgarian side of the Danube, the noise level will be minimised, so that the residential area on the Bulgarian side will not be affected at all.

The noise levels comply with the values laid down in *STAS 10009/2017 - Urban Acoustics - Permissible noise level limits*, as well as with the limit values according to *Government Decision No 1756/2006 (as subsequently amended and supplemented) on limiting the level of environmental noise emissions generated by equipment intended for use outside buildings.*

Noise during the construction period is temporary and intermittent, depending on how long the machinery is running.

During the operation of the objective, the static nature of the planned works is such that they do not produce noise and vibrations.

In conclusion, as a result of the implementation of measures to prevent/reduce the impact in terms of water, air and noise pollution, any possible negative impact will be totally eliminated on Romanian territory and therefore there will be no **negative cross-border impact.**

6.8 Interaction between environmental factors

The interactions between project-generated effects on environmental factors and secondary effects (effects that one environmental factor may have on another environmental factor) were analysed.

The secondary effects generated by the implementation of the project are presented in Table 51.

Table no. 52 - Secondary effects generated by the implementation of the project

Environmental factor	Interaction factor	Description of interaction

Environmental factor	Interaction factor	Description of interaction
Air	Public health	Emissions of sedimentable dust and other air pollutants and temporary changes in air quality at the site organisation and work zones can affect the health of workers. All the necessary measures will be taken to minimise the impact on the air (regular checking of machinery, spraying of work zones) and workers will be provided with personal protective equipment so that the health of workers or people passing through the area analysed will not be affected
	Biodiversity	Sedimentable dust deposition may affect the flora (altering photosynthesis/plant respiration processes), but the concentrations are low and the effects will disappear after the first rainfall, and as such the impact on biodiversity will not be significant. No protected habitats have been identified on the project site and in its immediate neighbourhood
	Surface water	The sedimentable dust generated by the works may reach the waters of the Argeș and Dâmbovița rivers, but the concentrations of these pollutants are low, the quality of the water body will not be affected and consequently there will be no impact on aquatic flora and fauna species
	Soil	Sedimentable dust may settle on soils in the neighbourhood of the working zones, but as it does not contain toxic substances, the impact on the soil will not be significant
Noise	Public health	Workers, people passing through or working in the area under review may be affected by increased noise intensity or duration. In order to minimise noise emissions, modern construction technology and machinery (equipped with noise traps) will be used, legal rest hours will be observed, no work will be carried out at night and additional sound-absorbing panels will be installed if measurements reveal that the maximum noise level is exceeded
	Biodiversity	Increased noise levels and the presence of machinery and labourers may disturb wildlife in the site area. Wildlife will move to similar habitats in the vicinity of the site, so there will be no reduction in the population of the species (with the only change consisting of a decrease in the relative density of intra- and interspecifics on the site), and the impact on wildlife is minor.
Water	Biodiversity	Water quality in the project area is not expected to change significantly, so the negative impact will be minor
	Air	With the machinery and equipment used during the execution of the works for the improvement of the two navigable watercourses (as described in the previous chapters), the level of noxious emissions in the areas of the work zones will be higher, but the impact will be limited in time and this report recommends a series of measures to minimise the impact that the operation of the necessary equipment and machinery could have during the works
Soil	Biodiversity	A temporary minor negative impact is expected during the construction period on biodiversity through disturbance of habitats on the soil and subsoil in the built areas.
Landscape	Public health	The presence of machinery, equipment and material stockpiles may temporarily affect the population in the riverside areas. This impact will be on the short term, only for the duration of the works, after which the area will be cleared of the remaining waste, the remains of materials left on the site, and the temporary buildings will be dismantled.

In Table 53 the interactions between the effects caused by the construction works are presented in the form of a matrix.

Table no. 53 - Interactions between project effects

Interaction matrix	Soil	Water	Air	Noise and vibration	Biodiversity	Landscape	Public health	Cultural heritage
Soil					x			

Interaction matrix	Soil	Water	Air	Noise and vibration	Biodiversity	Landscape	Public health	Cultural heritage
Water			x		x			
Air	x	x			x		x	
Noise and vibration					x		x	
Biodiversity	x	x	x	x		x	x	
Landscape					x		x	
Public health				x	x	x		
Cultural heritage								

6.9 Cumulation of effects with those of other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental significance which may be affected, or the use of natural resources

According to the data provided by the county environmental authorities and local municipalities (Annex no. 13), the following projects have been identified in the area neighbouring the project in Giurgiu County:

1. "Quarry fish pond - Copăceni III, commune of Adunații Copăceni, Giurgiu County" (Building Permit No 13/07 September 2009) - item 1 on the list of the Environmental Protection Agency of Giurgiu
2. "Extension of the quarry fish pond - Copăceni III, commune of Adunații Copăceni, Giurgiu County" - (Building Permit No 5/25 April 2013) - item 2 on the list of the Environmental Protection Agency of Giurgiu
3. "Extension of the quarry fish pond - Copăceni III, commune of Adunații Copăceni, Giurgiu County" - (Building Permit No 7/23 May 2013) - item 3 on the list of the Environmental Protection Agency of Giurgiu
4. "Quarry fish pond, communes of Dărăști Vlașca and Adunații Copăceni" - (Building Permit No 18/19 November 2014, updated by Annex 4811/26 May 2023) - item 4 on the list of the Environmental Protection Agency of Giurgiu
5. "River control works on the Argeș river for flood defence, irrigation and other uses, commune of Isvoarele, Giurgiu county" - (Building Permit No 7/10 August 2017) - item 5 on the list of the Environmental Protection Agency of Giurgiu
6. "Removal of alluvium material with extraction of mineral aggregates, commune of Isvoarele, Giurgiu county" - (Building Permit No 8/11 August 2017) - item 6 on the list of the Environmental Protection Agency of Giurgiu
7. "Removal of alluvium material with extraction of mineral aggregates, commune of Isvoarele, Giurgiu county" - (Environmental Assessment Screening Stage Decision No. 4905/09 August 2017) - item 7 on the list of the Environmental Protection Agency of Giurgiu
8. "Location of mineral aggregates sorting station, commune of Adunații Copăceni, Giurgiu county" - (Building Permit No 1/11 January 2018) - item 8 on the list of the Environmental Protection Agency of Giurgiu
9. "Quarry fish pond in the commune of Adunații Copăceni, commune of Adunații Copăceni, Giurgiu county" - (Building Permit No 10/27 June 2018) - item 9 on the list of the Environmental Protection Agency of Giurgiu
10. "Quarrying of mineral aggregates from the old bed of the Argeș river, commune of Isvoarele, Giurgiu county" - (Building Permit No 2/20 May 2019) - item 10 on the list of the Environmental Protection Agency of Giurgiu

11. "Quarry fish pond Copăceni V", commune of Adunații Copăceni, Giurgiu County - July 2019 (Building Permit No 5/09 October 2019) - item 11 on the list of the Environmental Protection Agency of Giurgiu
12. "Quarry fish pond, commune of Adunații Copăceni, Varlaam village, Giurgiu county" - (Building Permit No 8/11 August 2020) - item 12 on the list of the Environmental Protection Agency of Giurgiu
13. "Quarry fish pond Adunații Copăceni 3", proposed to be located in the commune of Adunații Copăceni, village Adunații Copăceni, NC 39499, Giurgiu County" - February 2021 (Building Permit No 7/28 July 2021) - item 13 on the list of the Environmental Protection Agency of Giurgiu
14. "Quarrying of mineral aggregates from deposit, Gostinari commune, Gostinari village, Giurgiu county" - (Building Permit No 12/22 November 20221) - item 14 on the list of the Environmental Protection Agency of Giurgiu
15. "Quarrying of mineral aggregates from the old bed of the Argeș river, zone 3, commune of Isvoarele, Giurgiu county" - (Building Permit No 13/02 December 2021) - item 15 on the list of the Environmental Protection Agency of Giurgiu
16. "Development and systematisation of the land by increasing the existing water span for fishpond development, Adunații Copăceni commune, Giurgiu County" - (Building Permit No 14/Copăceni II/21 December 2021) - item 16 on the list of the Environmental Protection Agency of Giurgiu
17. "Quarry fish pond, commune of Adunații Copăceni, Varlaam village, Giurgiu county" - (Building Permit No 3/02 June 2022) - item 17 on the list of the Environmental Protection Agency of Giurgiu
18. "Quarrying of mineral aggregates from the old bed of the Argeș river, zone 3, commune of Isvoarele, Giurgiu county" - (Building Permit No 13/28 November 2022) - item 18 on the list of the Environmental Protection Agency of Giurgiu
19. "Copăceni IV fishpond", commune of Adunații Copăceni, Giurgiu County (Building Permit No 7/27 June 2023) - point 19 on the list of the Environmental Protection Agency of Giurgiu
20. "Quarrying of mineral aggregates from the Argeș river bed, commune of Isvoarele, Giurgiu county" - (Building Permit No 2/10 May 2024) - item 20 on the list of the Environmental Protection Agency of Giurgiu
21. "Quarrying of gravel and sand for a future fish pond, commune of Adunații Copăceni, Giurgiu County" - (Building Permit No 3/12 June 2024) - item 21 on the list of the Environmental Protection Agency of Giurgiu
22. "Quarry fish pond, commune of Isvoarele, Giurgiu county" - (Building Permit No 5/18 July 2024S) - item 22 on the list of the Environmental Protection Agency of Giurgiu

Given that the above-mentioned works are mainly aimed at quarrying the mineral aggregates in the bed of the Argeș River, during the operation period, a cumulative impact will be generated with the project subject of this analysis by generating higher concentrations of suspended sediments in the water body (Argeș River).

The operations / activities that may generate a cumulative impact are:

- Quarrying of mineral aggregates
- Operation of sorting stations
- Operation of asphalt mixing stations
- Motor traffic to and from the site area.

The cumulative effect of these activities may have a negative impact (feeling of discomfort) on both the population in the areas around the sites (residents, people working in these areas) and the fauna, by:

- leakage of petroleum products from machines working in the Argeș river for the quarrying of mineral aggregates, river development, etc.
- pollution of the atmosphere with sedimentable dust from the handling of materials with a high

content of powdery material

- emissions from traffic in the area
- dust from motor traffic in the area
- noise pollution (noise generated by the operation of equipment/machinery used to carry out the works, road traffic).

The existence of these areas can generate a source of materials (sand, gravel, etc.) for the works of the Argeș river for navigation.

But according to information received from the designer, the material for the construction will be sourced from some of these quarries. Those located in the project's land take will be closed after completion of the works, as they are incompatible with the technical characteristics of the project.

This could be interpreted as a positive impact, but at the time of drafting this document no details were known about the exact location of the quarries and the number of quarries that will be closed after the works are completed.

Table 54 shows the other large as well as local infrastructure projects and their cumulative impact with the given project. Three major road infrastructure projects have been highlighted that may have **a temporary moderate - minor negative cumulative impact during the period of execution** with the given project, if the works are executed in the same time period.

There were also other 3 small projects highlighted with **moderate positive cumulative long-term impact**.

Table no. 54 - Analysis of the cumulative impact of other infrastructure projects in the area of interest with the given project

County	Settlement	NAME OF THE INVESTMENT OBJECTIVE	Project Status	Cumulative Impact
Large Infrastructure Projects				
Ilfov County	Măgurele (Dumitrana)	**Feasibility study for Bucharest-Alexandria Motorway** - public road, 77.02 km long, crosses Ilfov, Giurgiu and Teleorman counties. The origin of the Bucharest - Alexandria Motorway route was set at the junction of the Bucharest Bypass - A0 - Bucharest Ring Road at km 78+957 and the connection with the regional road DR 10 Bucharest - Măgurele Expres radial road near Dărăști - Ilfov, and the end of the route was set in the area of the Alexandria ring road - national road DN 6F, ensuring the connection with the future Corridor 4 on the Alexandria - Roșiorii de Vede - Caracal - Craiova route. The project crosses the Argeș river via a bridge at km 4+404 - at km 76+000 of the future navigable canal, in the Dumitrana area, and at km 60+000 of the future navigable Argeș canal it crosses radially near the canal site area. In this area, the project also foresees a land take for the site organisation with borrow pits **(Fig. 176).** **The characteristics of the bridge are:** • The length of the bridge is 994.73 on the outside and 984.60 on the inside; • Openings and length - 1x70.25 + 1x100.00 + 1x70.25m and 17 openings of 40.50m + 1 opening of 40.25m. • The width of the superstructure: 2x13.85m from P4 to C2 and 1x13.85m + 1x17.35m on the metal deck respectively from C1 to P3 • Roadway width: 2x3.75 = 7.50m • The width of the guardrail / parking lane / routing lane: 2x0.80/1x3.50m/1x0.50+1x0.75m • Safety parapets: H4b • Protective netting between the parapets • water drainage: drains channelled through PVC pipes	Feasibility Study at the end of the environmental procedure (EIR, AA) for the issuance of the environmental permit. The estimated duration of the project is 36 months.	A **temporary moderate cumulative negative impact** is expected if the two projects overlap, with works being carried out during the same period, particularly in the bridge area. The negative impact will be manifested through the accumulation of noise, air pollution with dust and noxious pollutants, on the soil and subsoil through the excavation of borrow pits, on the landscape through the scale of the works, on biodiversity through the displacement of fauna species and the disturbance and fragmentation of habitats, through the interruption of the lateral connectivity of the Argeș River. During the operation of the motorway, **a minor negative cumulative impact** is expected due to the traffic with noxious emissions and noise, the chasing away of fauna species, the creation of barriers for the migration of fauna from one bank of the Argeș River to the other, the prevention of planting of shelterbelts and the creation of conditions for the expansion of invasive plant species.
Ilfov County	Măgurele (Dumitrana)	**The Bucharest A0 motorway** is a new motorway ring around Bucharest with a length of about 100 km (**Fig. 177).** The southern segment of the A0 motorway is divided into three	Partially executed, Lot 3, National Road DN6 - A1 Motorway, 17.97 km, execution time 42	A **minor temporary negative cumulative impact** is possible in the case of overlapping works of the two projects through a significant

County	Settlement	NAME OF THE INVESTMENT OBJECTIVE	Project Status	Cumulative Impact
		sections: • Lot 1, A2 Motorway - Railway Line 902 (Jilava), 16.9 km, a section of 6.00 km between Popești Leordeni and Railway Line 902/Jilava opened in April 2024, segment opened in July 2024 • Lot 2, Railway Line 902 (Jilava) - National Road DN6, 16.3 km, 10.00 km between National Road DN5 and National Road DN6 opened in December 2023, 6.30 km segment between Railway Line 902/Jilava and National Road DN5 opened in April 2024 • Lot 3, National Road DN6 - A1 Motorway, 17.97 km, execution time 42 months.	months.	increase in heavy traffic on certain road sections associated with the transport of aggregates and construction materials necessary for the execution of the project and the diversion of traffic from areas where relocation works are necessary on existing roads. The impact may be manifested by a high level of noise and noxious concentrations emitted by the traffic volumes crossing the road sectors adjacent to the two road projects: the A0 Motorway junction and the Bucharest - Alexandria Motorway
Ilfov County	Măgurele	**Regional road DR10 - Măgurele Expres (Fig. 177)** will be 11.17 km long and will connect Măgurele to Bucharest, on the route A0 Motorway - Măgurele - Măgurele Industrial Park - DNCB - Prelungirea Ferentari (Sector 5)	It involves the preparation of a Feasibility Study, a Project for the authorization of the execution of construction works (PAC) and the obtaining of the Building Permit, within 12 months from the date of signing the contract, the project is currently at the stage of obtaining the urbanism certificates, and the multi-criteria analysis stage has been completed	No negative cumulative impact is expected
Ilfov, Giurgiu	Comana	**Rehabilitation of the Bucharest - Giurgiu Railway (Fig. 178)** Under the contract for the modernisation of the Bucharest - Giurgiu railway line, on the line Bucharest Progresu (km 5+421) -	Work is due to start in 2026, when the line will have to be closed for	A **minor temporary negative cumulative impact** is possible in the case of overlapping works of the two

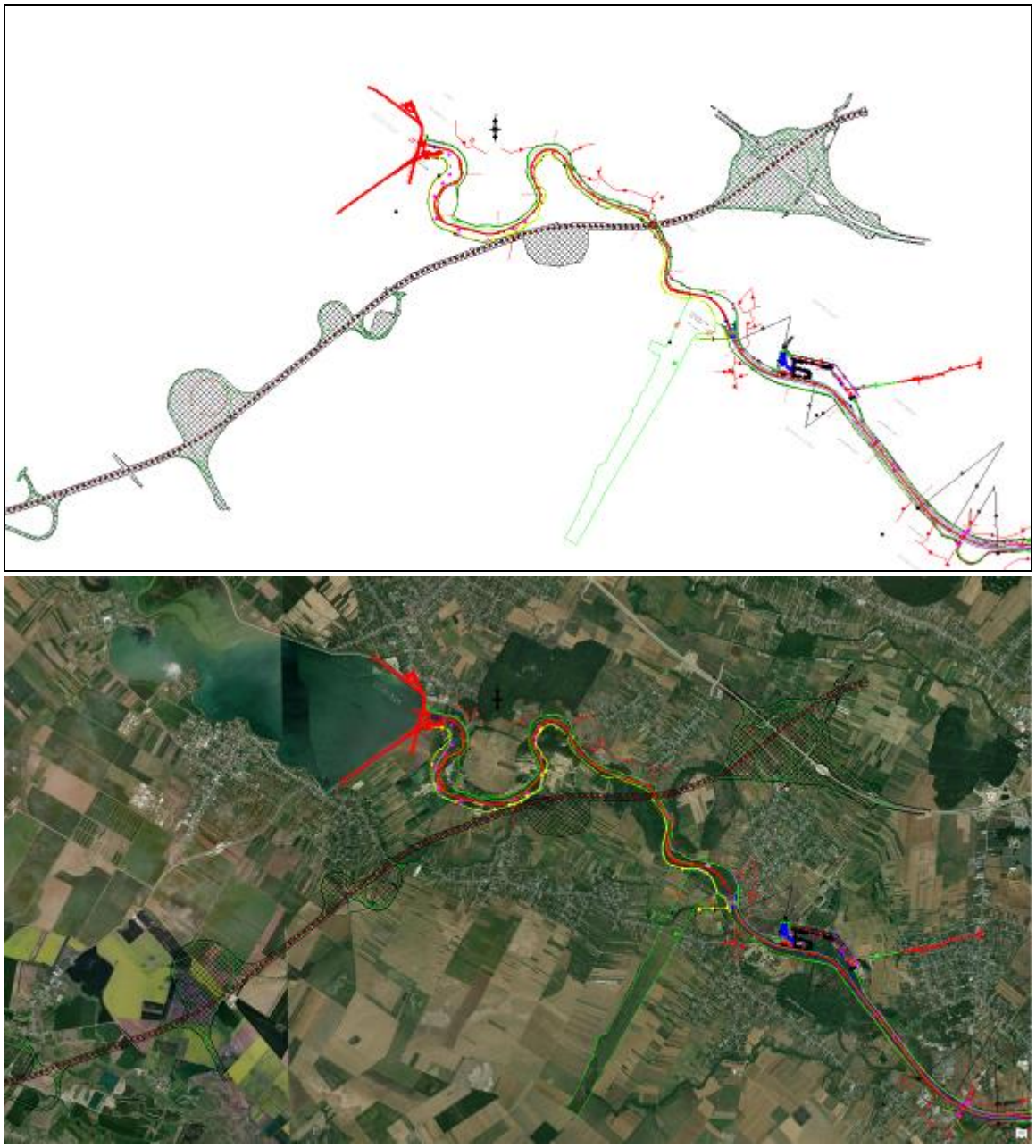
County	Settlement	NAME OF THE INVESTMENT OBJECTIVE	Project Status	Cumulative Impact
		Giurgiu City Station (km 67+332), modernisation (except for 12 km between Vidra - Comana, Lot 1, which has already been modernised by Porr Construct) and electrification works will be carried out. Modernisation and electrification works will also be carried out between Giurgiu North (km 64+044) and Ruse Bridge (km 69+700). On the railway line between Progresu - Jilava - Giurgiu North - Giurgiu North Border sector, rehabilitation and electrification works will be planned, including an ERTMS level 2 traffic management system.	another three years, at least on some sections.	projects through a significant increase in heavy traffic on certain road sections associated with the transport of aggregates and construction materials necessary for the execution of the project and the diversion of traffic from areas where relocation works are necessary on existing roads. The project will generate a high level of noise and noxious concentrations generated by traffic volumes crossing the road sections adjacent to the two projects in the Comana-Vidra area, after the rehabilitated segment.
Călărași	Radovan, Curcani	**Natural gas transmission pipeline in the area of the Black Sea coast-Podișor"** (including cathodic protection, power supply and fibre optics), Călărași county. The Black Sea Coast - Podișor pipeline (308.3 km long) will be connected to the 032" x 55 bar Podișor - Corbu pipeline, which is part of the Bulgaria-Romania-Hungary-Austria transport corridor. The crossing of the flood protection dams on the banks of the Argeș river with the designed natural gas transmission pipeline, sized 040" (DN 1016mm), between the Black Sea Coast - Podișor and with the technological pipeline sized 08" (DN 219.1 mm) for fibre optic tube, will be made on the administrative territory of the localities of Radovanu (right bank dam) and Curcani (left bank dam), at km 14+000 approximately, of the future navigable canal on Argeș river. The undercrossing will be done by the horizontal directional boring method, by making a tunnel into which the pipe is pulled **(Fig. 179).**	Favourable opinion subject to conditions, issued by Ițani S.A. as general designer of the investment objective "River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses". Project in progress.	No negative cumulative impacts are expected. The gas pipeline is under construction, it is expected to be completed before the start of works on the project.
Other Infrastructure Development projects of local, regional interest				
Giurgiu	MIHAILESTI	Modernisation of local streets in Mihăilești: tarmac, concrete ditches, pavements and culverts of approx. 60000m2	Uncertain	No negative cumulative impact is expected
		Drinking water introduced under Government Order 7 in Popești and Novac villages	Uncertain	No negative cumulative impact is expected

County	Settlement	NAME OF THE INVESTMENT OBJECTIVE	Project Status	Cumulative Impact
		Sewerage in Popesti and Novaci villages	Uncertain	No negative cumulative impact is expected
		Extension of the natural gas network to uncovered streets in Mihailești town	Uncertain	No negative cumulative impact is expected
		Extending the electricity grid in selected areas	Uncertain	No negative cumulative impact is expected
		Extending and modernising street lighting on selected streets	Uncertain	No negative cumulative impact is expected
		Type 1 sports centre	Approved by the National Investment Company	No negative cumulative impact is expected
		Completion of construction of apartment building no. 205 with 9 apartments	Uncertain	No negative cumulative impact is expected
		Administrative seat Mihăilești City Hall	Uncertain	No negative cumulative impact is expected
Ilfov County	Dărăști-Ilfov	Construction of sewerage system and wastewater treatment plant	Uncertain	**Moderate long-term positive cumulative impact** by greening the area
		Extension and modernisation of water supply system	Uncertain	No negative cumulative impact is expected
		Construction of new water station	Uncertain	No negative cumulative impact is expected
		Extension and modernisation of natural gas distribution networks	Uncertain	No negative cumulative impact is expected
		Sports centre construction;	Uncertain	No negative cumulative impact is expected
		Construction of sports hall	Uncertain	No negative cumulative impact is expected
		Extension of the electricity network for citizens' households;	Uncertain	No negative cumulative impact is expected
		Street modernisation in Dărăști-Ilfov commune	Uncertain	No negative cumulative impact is expected
	Măgurele	Day care (CONSTRUCTION)	Uncertain	No negative cumulative impact is expected
		Construction of a full-day kindergarten ROP - SMIS 124563	Uncertain	No negative cumulative impact is expected
		Rehabilitation and rationalisation of the public lighting system in	Uncertain	No negative cumulative impact is

County	Settlement	NAME OF THE INVESTMENT OBJECTIVE	Project Status	Cumulative Impact
		Măgurele town		expected
		Promenade lighting	Uncertain	No negative cumulative impact is expected
		Establishment of Dumitrana Park	In progress, on an area of 60923 square metres	No negative cumulative impact is expected
		Rehabilitation of green spaces and parks	Uncertain	No negative cumulative impact is expected
		Development and refurbishment of Măgurele City Centre	Uncertain	No negative cumulative impact is expected
		Burying cables	Uncertain	No negative cumulative impact is expected
		Bike lanes	Uncertain	No negative cumulative impact is expected
		Foot paths	Uncertain	No negative cumulative impact is expected
		Development of foot paths, ditches, road culverts	Uncertain	No negative cumulative impact is expected
		Rehabilitation of historical monuments	Uncertain	No negative cumulative impact is expected
		Măgurele Sports Complex	Uncertain	No negative cumulative impact is expected
		Asphalting streets	Uncertain	No negative cumulative impact is expected
		11 electric car charging stations	Uncertain	No negative cumulative impact is expected
	1 DECEMBRIE	Building and equipping an after-school programme centre	Uncertain	No negative cumulative impact is expected
		Modernisation, rehabilitation - New construction and equipping of a day care centre	Uncertain	No negative cumulative impact is expected
		Construction of housing for young people and/or specialists (52 apartments)	Uncertain	No negative cumulative impact is expected
		Extension and modernisation of the public water supply network	Uncertain	No negative cumulative impact is expected
		Extension and modernisation of the public wastewater system	Uncertain	No negative cumulative impact is expected
		Increasing the energy efficiency of public lighting	Uncertain	No negative cumulative impact is expected

County	Settlement	NAME OF THE INVESTMENT OBJECTIVE	Project Status	Cumulative Impact
		Extension of the public gas supply network	Uncertain	No negative cumulative impact is expected
		Extension and modernisation of the public electricity network	Uncertain	No negative cumulative impact is expected
Călărași	Vasilați	CONSTRUCTION OF PHOTOVOLTAIC POWER PLANT"- SC PVSOLAR 7 SRL - outside the built-up area of Vasilați commune, Călărași county **(Fig. 180)**	Uncertain	**Moderate positive long-term cumulative impact** by reducing CO2 and other greenhouse gas emissions
	Crivăț	Project "Establishment of sewerage network in the commune -, county -" through the National Investment Programme "Anghel Saligny",	Project approved in 2023	No negative impacts have been identified. A **moderate long-term positive cumulative impact is expected** through the greening of the area and on surface/groundwater quality.
	Oltenița	Oltenița Municipality Ring Road	Uncertain	No negative cumulative impact is expected
		Tourist Harbour in Oltenița Municipality	Uncertain	No negative cumulative impact is expected
		Freight Port in Oltenița Municipality	Uncertain	No negative cumulative impact is expected
		Development of Argeș Tourist Park	Uncertain	No negative cumulative impact is expected
		Green transport infrastructure - bicycle lanes in Oltenița Municipality	Uncertain	No negative cumulative impact is expected
	Șoldanu, Radovanu and Căscioarele	FS "Development of an intelligent natural gas distribution network in Şoldanu, Radovanu and Căscioarele communes, Călărași County".	Uncertain	No negative cumulative impact is expected

Figure 176 shows the project plan overlaid with the Bucharest-Alexandria Motorway.



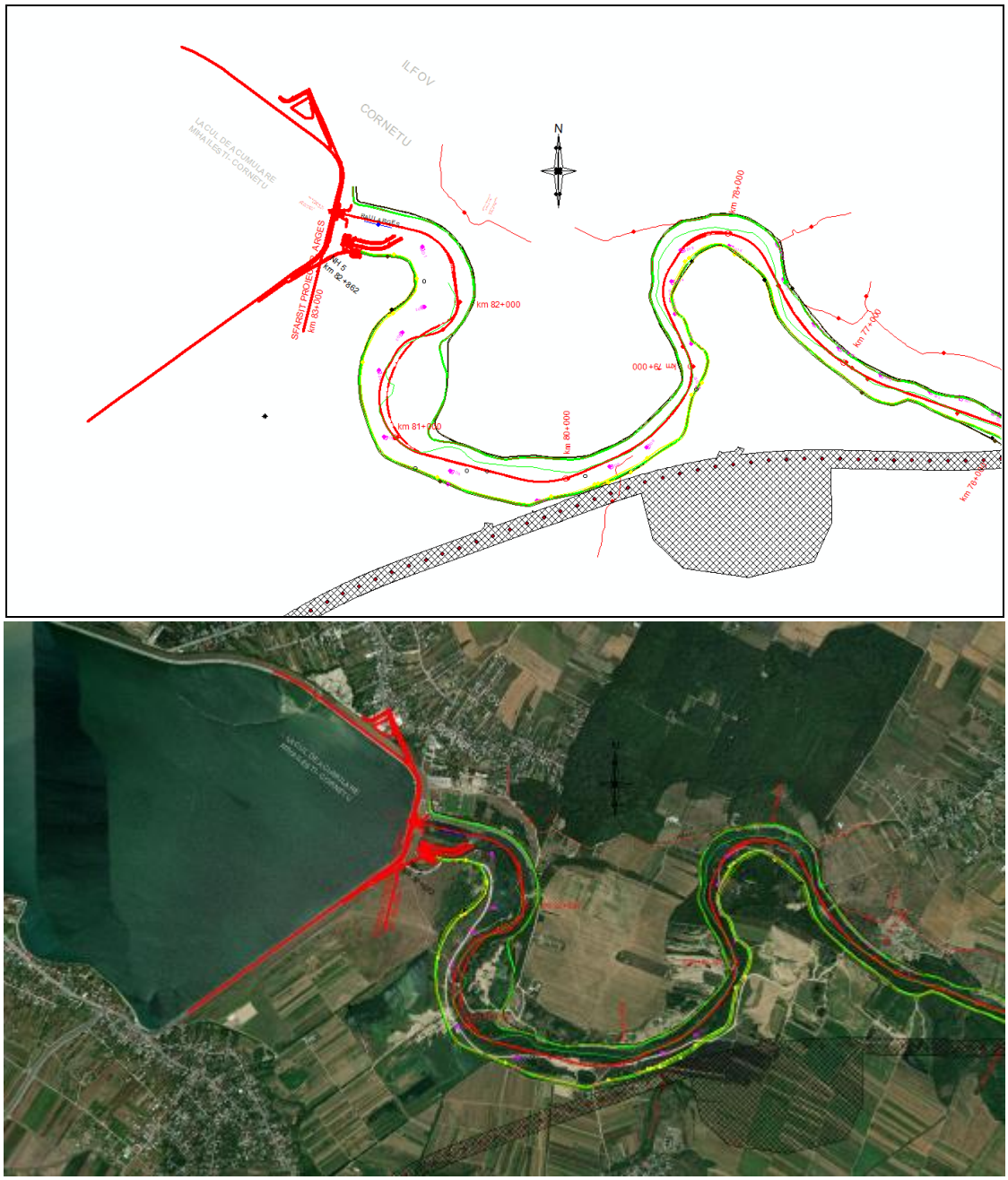


Figure no. 176 - Bucharest-Alexandria Motorway in relation to the Argeș navigable canal project

Figure 177 shows the plan of the link area between the 3 major road infrastructure projects: Bucharest-Alexandria Motorway, A0 Motorway and Regional Road DR10.

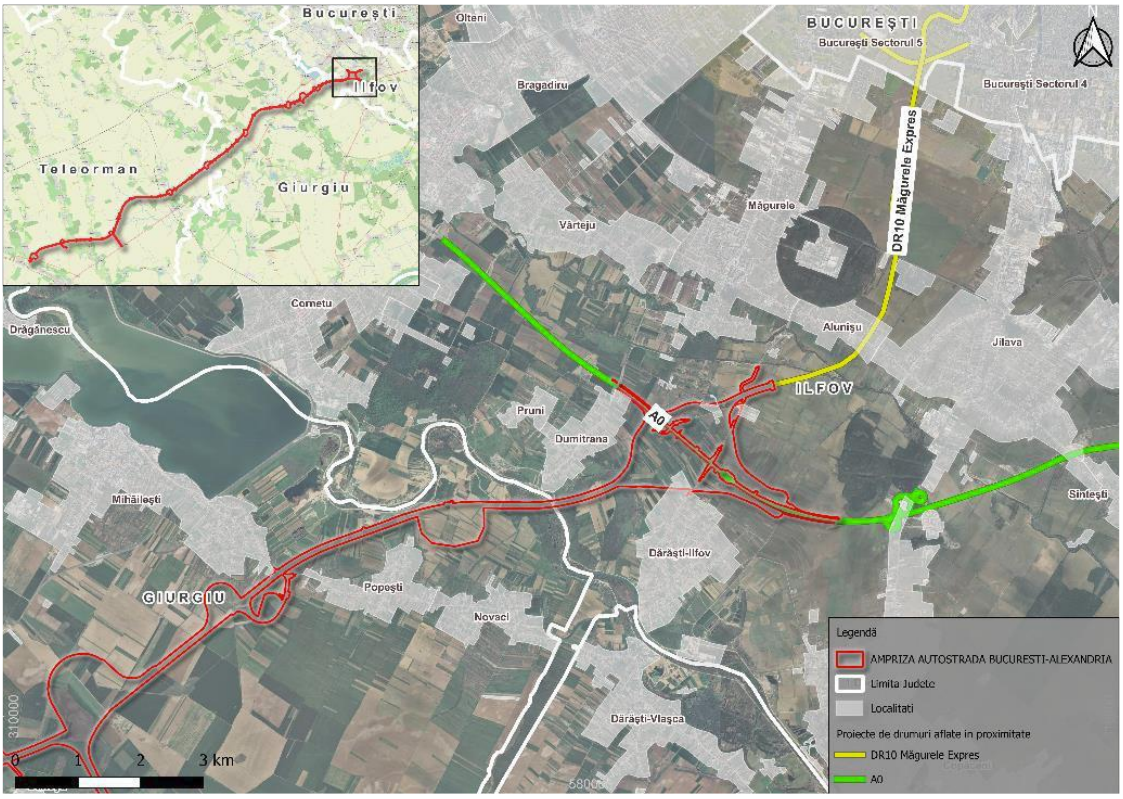


Figure no. 177 - Bucharest-Alexandria Motorway link area with A0 Motorway and Regional Road DR10

Figure 178 shows the plan of the project on Argeș in the area of the intersection with the Bucharest-Giurgiu railway line.



Figure no. 178 - Comana-Vidra segment of the Bucharest-Giurgiu railway line

Figure 179 shows the plans of the natural gas transmission pipeline in the Black Sea coast-Podișor area, Călărași County, in relation to the Argeș River navigable canal project.

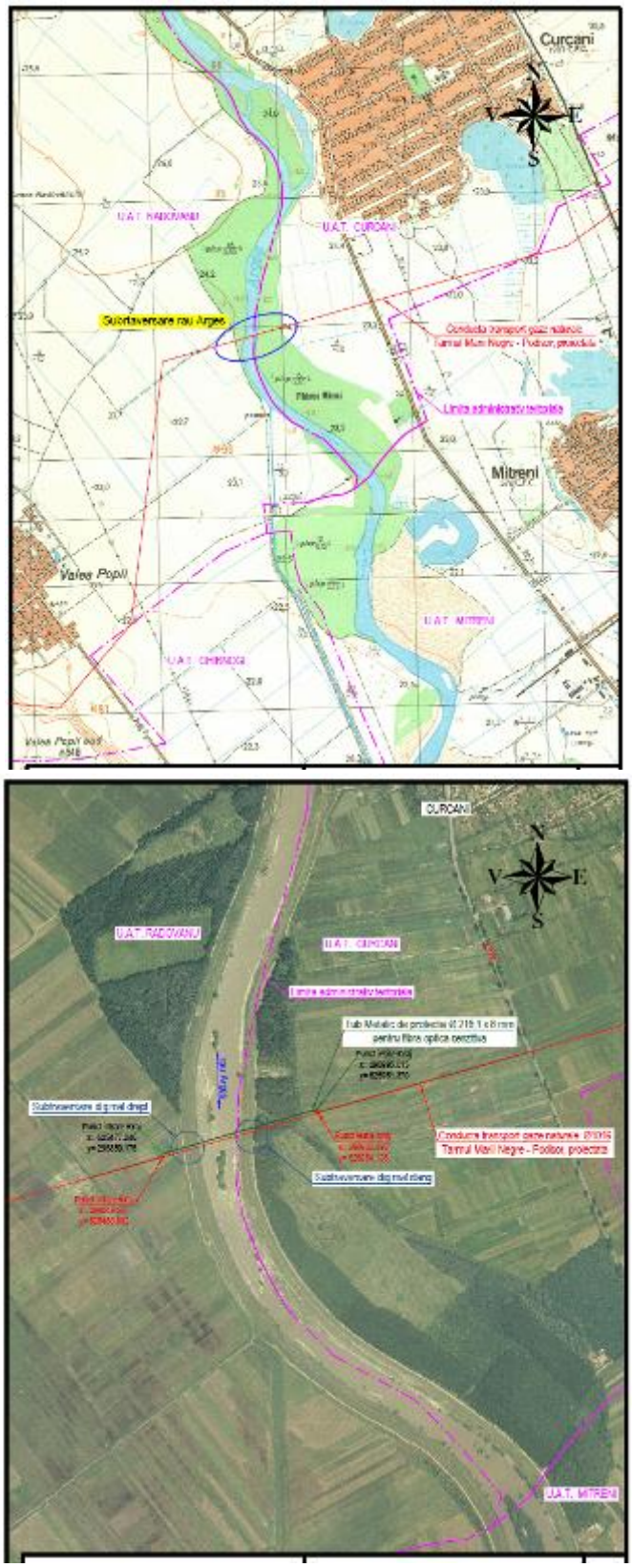


Figure no. 179 - The natural gas transmission pipeline from the Black Sea Coastline-Podișor in relation to Argeș navigable canal project

Figure 180 shows the location of the photovoltaic power plant outside the built-up area of the Vasilați commune, Călărași county in relation to the Argeș river.

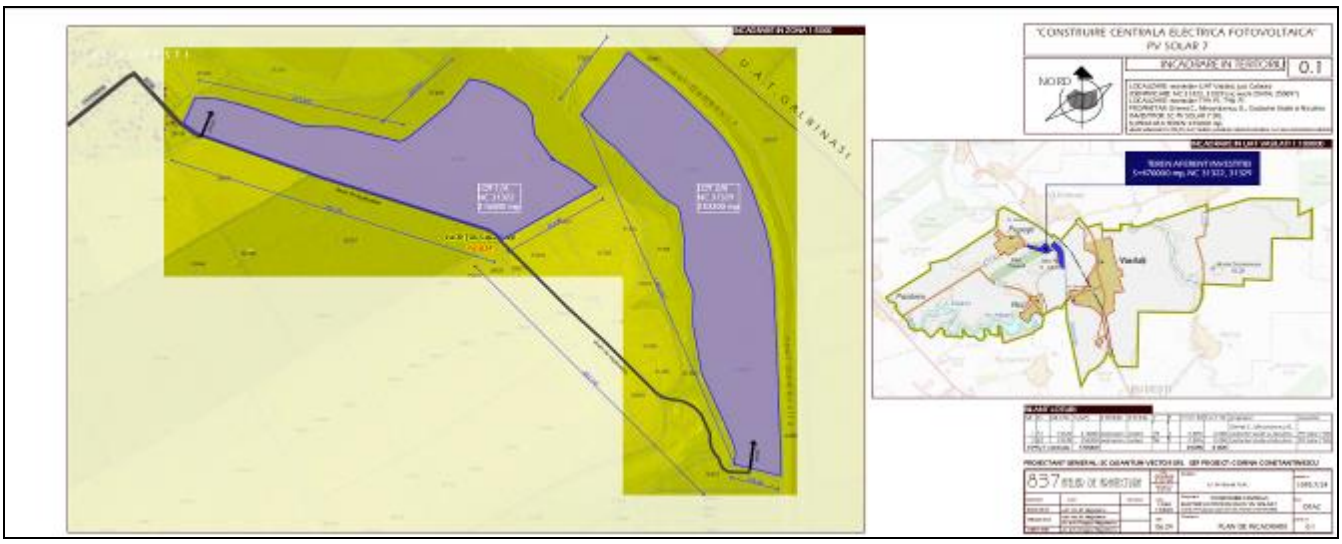


Figure no. 180 - Location of the photovoltaic power plant outside the built-up area of the Vasilați commune, Călărași county, in relation to the Argeș river

6.10 Technologies and substances used

The technologies and materials used to execute the works proposed by this project are detailed in Chapter 2 of this report.

The execution technologies do not differ from those generally used for river control works intended for navigation, flood risk reduction, etc. (works that are proposed by this project) and are based on best available practices.

Hazardous substances will not be used or stored on the premises of the site organisations / work zones for the execution of the works.

The refuelling of equipment and vehicles used for carrying out the works will be carried out only at authorised refuelling stations in the areas adjacent to the works site.

Hazardous substances could be released directly into the environment only in the event of an environmental incident (machinery/vehicle breakdowns, accidental spills of fuels, oils on the ground and/or in water).

7. Description of the forecasting methods used to identify and assess environmental effects, including details of any difficulties

The description of the relevant aspects of the current state of the environment in the project area and its likely evolution if the project is not implemented has been made both on the basis of publicly available data and on the basis of the experience gained from other projects by the experts preparing this documentation.

The main public data sources consulted are:

- ✓ Annual report on the state of the environment in Ilfov, Giurgiu and Călărași counties;
- ✓ Updated management plan of the Argeș - Vedea river basin;
- ✓ Land Use Plan;

- ✓ Statistical data from the Statistical Department of Ilfov, Giurgiu and Călărași counties;
- ✓ Analysis reports provided by the National Meteorological Administration;
- ✓ Relevant guidelines;
- ✓ Scientific publications;
- ✓ European Environment Agency website: information on Natura 2000 biodiversity, reporting on Article 17 of the Habitats Directive and Article 12 of the Birds Directive (EIONET), etc;
- ✓ Natura 2000 standard forms;
- ✓ Natura 2000 site management plans;
- ✓ Websites of the National Agency for Protected Natural Areas (ANANP), Ministry for Environment, Water and Forests (MMAP);
- ✓ Other relevant projects, Impact Assessments and Appropriate Assessments.

In order to predict the impacts, the types of pollution likely to occur at the proposed project site and in the neighbouring area were analysed:

- pollution specific to construction works and consisting of dust pollution, chemical emissions, noise and vibrations generated by construction machinery and means of transport;
- accidental pollution, in particular with oil products spilt accidentally as a result of breakdowns of machinery and means of transport, emergency fuelling from unsuitable containers without taking safety measures, etc.

The main pollutants generated by the proposed project during the analysed construction period are:

- dust, generated on the construction site (excavation, loading - unloading, handling and transport of excavated earth and bulk building materials) and on the access road during transport (dust resulting from the movement of means of transport on the temporary earth road).
- chemical emissions generated by the combustion of fuels in the engines of machinery and means of transport on the access road;
- noise, generated by machines and means of transport;
- vibrations, generated by machinery and means of transport;
- poorly managed waste.

The proposed project does not contemplate the use of any radiation sources, therefore, the natural background radiation will not alter the area in any way. The implementation of the proposed project does not involve the use of chemicals hazardous to flora, fauna or public health.

The methodology considered for analysing the project proposes a differentiation between the concept of 'effect' and 'impact'.

In assessing the significance of impacts, a cautious approach has been used to ensure that the impact assessment is objective and consistent, including the use of *"expert opinion".*

The effects refer to the changes caused to the biotic and abiotic environment as a direct consequence of the causes (interventions) generated by the project (both during the implementation and the operational phase).

Impacts include changes at the level of sensitive receptors, i.e. Natura 2000 components (Natura 2000 habitats, Natura 2000 populations, Natura 2000 species habitats) and ecosystems as a whole.

Identifying effects involved the following steps:

- analysing the interventions proposed in the project;

- identification of activities resulting from the execution and operation of project components;
- identification of changes (effects) occurring in the biotic and abiotic environment as a result of the implementation and operation of project components.

Of interest for the evaluation were mainly those effects that can be quantified and that lead with certainty to some form of impact.

Impact magnitude is a combination of all the elements characterising an impact (nature, type, reversibility, extent, duration, intensity) based on the evaluator's experience.

The criteria for determining the magnitude of impact differ for physical, biological and social environmental factors.

The parameters taken into account to assess the magnitude of impacts are presented below.

In order to determine the significance of the impact, receptor sensitivity was also analysed, which refers to the sensitivity of the receiving environment to the effects, including its capacity to adapt to the changes brought about by the project. Sensitivity can be low, medium or high.

Using the impact magnitude and receiver sensitivity the overall significance of the impact could be determined, as shown in Tables 55-57.

Table no. 55 - Components of impact magnitude

Impact magnitude components	Variables of assessment parameters	Description of the characteristics of the variables of the assessment parameters
Nature impact	Positive	Involves a negative modification of the initial conditions or introduces a new, undesirable factor
	Negative	Implies an improvement on initial conditions or introduces a new, desirable factor
	Both	Implies a negative, but at the same time a positive change to the initial conditions
Type of impact	Direct	Results from the direct interaction between a plan activity and an environmental factor
	Indirect	Results from other activities or as a consequence or circumstance of the project
	Secondary	Direct or indirect impact as a result of repeated interaction between project components and environmental factors
	Cumulative	Impact that acts together with another impact (including impacts of other plans/projects/activities) affecting the same environmental factor or receptor
Reversibility of impact	Reversible	The affected environmental factor (the receptor) can return to its initial state
	Irreversible	The affected environmental factor (the receptor) cannot return to its initial state
Extent of impact	Local	Affects local receptors in the neighbourhood of project components. A local impact usually occurs within a radius of up to 5 km from the source. The area of influence needs to be defined
	Regional	Affects receptors within a radius of about 5-40 km from the source and has a regional spread
	National	Affects national environmental factors
	Cross-border	Affects environmental factors at an international level
Duration of impact	Temporary	Occurs over a short period of time and possibly intermittent/occasionally
	Short-term	The impact is active for a limited, short period of time and will cease

Impact magnitude components	Variables of assessment parameters	Description of the characteristics of the variables of the assessment parameters
		entirely on completion of the activity causing it. Impacts are also short-lived if they are removed by appropriate measures or the environmental factor is restored.
	Long-term	Manifests itself over a long period of time, but it ends once the project is closed. Also, the impact is long-lasting even if intermittent, but it manifests itself throughout the lifetime of the project
	Permanent	It manifests itself in all phases of the project and remains active even after the project has been closed. In other words, it causes permanent changes to biotic and abiotic resources or receptors
Impact intensity	Low	The effects of the impact manifestation fall within the natural limits of variability of the receptor, without the need for receptor restoration.
	Medium	The effects of the impact manifestation exceed the natural variability limits of the receptor and the recovery time is medium (<2 years).
	High	The effects of the impacts exceed natural limits of variability, causing irreversible or reversible disruptions over long periods of time (>2 years).

Table no. 56 - Determination of impact significance according to impact magnitude and receptor sensitivity

	Low magnitude	Medium magnitude	High magnitude
Low value/sensitivity	Minor	Minor	Moderate
Mean value/sensitivity	Minor	Moderate	Major
High value/sensitivity	Moderate	Moderate	Major
Significance of the impact			
No impact or insignificant impact	The impact does not generate quantifiable (visible or measurable) effects in the natural state of the environment		
Minor significance	The impact has low magnitude, falls within the standard and/or is associated with receptors with low to medium value/sensitivity. Medium-magnitude impact affecting low-value receptors		
Moderate significance	Impact that falls within limits, with low magnitude affecting high value receptors, or medium magnitude affecting medium value receptors, or high magnitude affecting medium value receptors.		
Major significance	Impact that exceeds limits and standards and is of high magnitude affecting medium value receptors or is of a medium magnitude affecting high value receptors.		

Table 57 - Description of impacts according to their significance

Significance of the impact	Effects on the biotic component (biodiversity)	Effects on the abiotic component (socio-economic)	Area of concern	Consequences for the project holder
Major - - - -	Degradation of quality or habitat and/or wildlife availability with recovery greater than 2 years.	Changes in commercial activity leading to loss of income or opportunities beyond the normal variation limit. Potential short-term effects on health/quality of life; real risk of injury.	Big concern generating campaigns at large level (regional, national)	Take measures to avoid these impacts where possible and closely monitor the area affected by residual impacts.
Moderate - - -	Changes in habitats or species beyond natural variability,	Changes in commercial activity leading to loss of income or	Widespread concern, press articles, no	Measures to minimise the extent of impacts

Significance of the impact	Effects on the biotic component (biodiversity)	Effects on the abiotic component (socio-economic)	Area of concern	Consequences for the project holder
	with a recovery potential of up to 2 years.	opportunities in the normal variability/risk interval. Possible but unlikely to affect health / quality of life. Reduced risk of accidents	sustained campaigns	
Minor -	Changes in habitats or species that can be observed and measured but are on the same scale as natural variability.	Possible disruption of other activities and minor influence on income and opportunities. Discomfort within acceptable limits. No effects on health / quality of life of the population.	Temporary local concern of a person or group of people who feel discomfort	Realising the potential impact and managing the activity and operations in order to minimise interactions
Negligible	Changes in habitats and species within natural variability - difficult to measure or observe.	Visible but acceptable effects on other commercial activities (no disruption). Remarkable effect, but without consequences on health and quality of life of the population.	Effect acknowledged at local level, but no cause for concern	No interventions are required, but the holder must ensure that these effects do not increase in significance
No interactions 0	No effects	No effects	No concerns	Ensuring that possible changes in the activity do not change the impact classification
Positive + + +	Improving ecosystems by creating favourable habitats, creating conditions for increasing populations and their distribution - improving the conservation status of habitats and species	Benefits for the local community, improving health and quality of life.	No concerns	Efforts to maximise benefits

The common criteria used to assess the significance of impacts on environmental factors are presented in Tables 58-75.

Using the magnitude of impact and receptor sensitivity, the overall significance of the impact on environmental factors was assessed according to the classifications in these tables.

Table no. 58 - Surface water importance/sensitivity classification

Importance/ sensitivity of receptor	Characteristics
Very low	Heavily polluted watercourses, e.g. those with severely restricted or impoverished ecosystems, or watercourses whose biodiversity is limited to pollution-tolerant species; Watercourses of no community use or intended for industrial use only; Ichthyofauna is absent or only sporadically present
Low	Watercourses that have pre-existing pollution, the use or value of which is limited to use by wildlife or local communities; Low water use for agriculture or industry; Ichthyofauna is low in numbers.
Moderate	Watercourses used for recreational fishing or bathing; Water is widely used for agriculture; Watercourses that support good fish populations.
High	A watercourse of high (chemical and biological) quality, e.g. close to its natural state or close to that expected for an unpolluted watercourse; A watercourse important in supporting an economically/ecologically valuable area or species, or designated for its ecological importance at national level; Watercourse used for drinking or domestic purposes (e.g. washing and cooking) by a small number of users; Watercourse supporting large populations of ichthyofauna; A watercourse that supports commercial or subsistence fish farming; Flood risk area.
Very high	A watercourse of very good quality (chemical and biological), e.g. in its natural state or corresponding to that expected for an unpolluted watercourse; A watercourse that is important in supporting an area or species of community/conservation interest; Watercourse used for drinking or domestic purposes (e.g. washing and cooking) by a large number of users; Watercourse supporting rich and important populations of ichthyofauna.

Table no. 59 - Classification of the magnitude of impact on surface water

Magnitude	Characteristics
Very low	The type of impact cannot be differentiated (direct/indirect); No noticeable effect on users.
Low	The quality of the effluent is maintained within the limit values according to the legislation in force, without changing the quality class of the receptor watercourse; Physical disturbance to the watercourse is strictly limited to the working zone; Visible sediment and increased water turbidity, as well as <15% decrease in river flow downstream for less than a week; Minor change in initial quality. Direct or indirect impacts will be perceptible, but resource utilisation and value will not be affected; Rapid return to baseline conditions upon completion of project activities.
Moderate	Visible sediment and increased stream turbidity for a period of 1-3 weeks after completion of construction, as well as decreased river flow by 15% downstream for more than a week or 15-40% for no more than a week; Direct or indirect impacts on users.

Magnitude	Characteristics
	No permanent changes in watercourse quality, composition or attributes occur and/or its use is only temporarily impaired or restricted without threat to overall integrity; The estimated time to return to baseline is 3-6 months, depending on the receptor.
High	The effluent quality exceeds the limit values according to the legislation in force or changes the quality class of the receiving water body, but the dilution of pollutants is rapid; Visible sediment and increased stream turbidity observed for more than 3 weeks but less than 3 months after construction completion; Decrease in river flow by 15-40% downstream for more than one week or > 40% for up to one week; The project causes temporary flooding over a small area; Direct or indirect impacts on users; Changes in the quality, composition or attributes of the watercourse occur as a result of project implementation, threatening the overall integrity of the watercourse, with its use being significantly but temporarily restricted
Very high	The effluent quality exceeds the limit values according to the legislation in force or changes the quality class of the receiving water body, but the dilution of pollutants is low; Visible sediment and increased stream turbidity observed for more than 3 months after construction completion; Decreased river flow by 40% downstream for more than a week; The project causes temporary flooding over a large area; The total loss or major alteration of key elements/characteristics of the watercourse such that the quality/composition/attributes after completion of construction will be fundamentally altered or may be totally lost and the use of the resource permanently impaired.

Table no. 60 - Classification of air importance/sensitivity

Importance/ sensitivity of receptor	Characteristics
Very low	Unpopulated areas; Unutilised land or used for grazing; Wildlife species that are not sensitive to pollutant emissions
Low	Areas of transit for the population, where exposure over a long period of time is unlikely (e.g. workers in agricultural fields); Crops and vegetation with high tolerance to dust emissions (e.g. cereals, feed crops, etc.); Fauna with reduced sensitivity to pollutant emissions (e.g. highly mobile mammals).
Moderate	Areas or buildings where occasionally longer periods of exposure of the population may occur; Crops and vegetation with moderate sensitivity to dust emissions; Fauna with moderate sensitivity/tolerance to pollutant emissions
High	Areas or buildings such as schools, offices, shops or markets where exposure will be high but not constant; Crops, vegetation and fauna with high sensitivity/low tolerance to pollutant emissions (e.g. greenhouses, nurseries, orchards, etc.); Protected natural areas of national interest.
Very high	Residential buildings (including hospitals) with almost constant human presence and where long-term exposure to pollutants is likely; Crops, vegetation and fauna with very high sensitivity/very low tolerance to pollutant emissions; Protected natural areas of international interest

Table no. 61 - Classification of the magnitude of impact on air

Magnitude	Characteristics
Very low	Project contributions to the existing level of pollutants are <5% of the maximum admissible concentrations (MAC) according to the legislation in force; There is no visible increase in dust levels; Temporary emissions of pollutants during construction.
Low	The contributions of the project to the existing level of pollutants represent 5-20% of the MAC, as required by current legislation; Visible increases in dust levels, which can lead to complaints or adverse health effects.
Moderate	The contributions of the project to the existing level of pollutants represent 20-50% of the MAC, as required by current legislation; Dust may cause minor damage to people, assets, crops or biodiversity
High	Project contributions to the existing pollutant level are >50% of the MAC, as required by current legislation; Dust can cause measurable but not significant damage to people, health, assets, crops or biodiversity.
Very high	Project contributions to the existing pollutant level are >70% of the MAC, as required by current legislation; Dust can cause significant damage to people, health, assets, crops or biodiversity.

Table no. 62 - Classification of soil/subsoil importance/sensitivity

Importance/ sensitivity of receptor	**Characteristics**
Very low	Unutilised land; The area is not geologically hazardous.
Low	Land used for occasional grazing;
Moderate	Agricultural land used for growing cereals; Land used for grazing
High	Land used for orchards or other high value crops; Sites designated as nationally protected on the basis of their geological/pedological or ecological character; Soils with sedimentation rates substantially lower than erosion rates
Very high	The occurrence of erosion or landslides associated with the project, thus affecting neighbouring houses or communities; Sites designated as internationally protected on the basis of their geological or ecological character.

Table no. 63 - Classification of the magnitude of impact on soil/subsoil

Magnitude	**Characteristics**
Very low	The occurrence of leaks or accidents causing damage only in restricted areas, after which the restoration to the initial state takes place within a few days or a month at most (complete restoration is achieved as a result of cleaning operations).
Low	Minor losses in productivity, expected to last up to 6 months after restoration to the initial status; In areas of reverse slope caused by the project, water puddles less than 3 months after construction; The production of deformation phenomena (slow flow) over time under the same load. The occurrence of spills or accidents that cause local damage in small areas, after which the restoration to the initial status occurs within up to 6 months.
Moderate	Minor losses in productivity, expected to last 6-12 months after restoration to the initial status; In areas of reverse slope caused by the project, the water puddles for 3 to 12 months after construction; Soil erosion is evident but does not lead to visible ravines; The occurrence of leaks or accidents that cause local or point damage, following

Magnitude	Characteristics
	which the restoration to the initial state takes place within 6-12 months.
High	Minor productivity losses, expected to last 1-5 years after restoration to the initial state; In areas of reverse slope caused by the project, the water puddles for 1 to 5 years after construction; Soil erosion leads to crevice formation; Occurrence of landslide or subsidence phenomena that do not extend beyond the project area; Occurrence of leakages or accidents causing local damage, which take more than 1 year to restore to initial state
Very high	Moderate or major losses in productivity expected to last more than 5 years after restoration to the initial state; In the areas of reverse slope caused by the project, water is permanently puddling; Formation of crevices and ravines is extensive, with potential impact on neighbouring land; Occurrence of landslide, subsidence or crushing phenomena extending outside the project area; The occurrence of spills or accidents that cause damage over large areas, after which the restoration to the initial state takes more than 1 year.

Table no. 64 - Classification of biodiversity importance/sensitivity

Importance/ sensitivity of receptor	Characteristics
Very low	Heavily anthropized habitats with ruderal, invasive vegetative elements, invasive faunal elements, common, of no conservation importance
Low	Habitats with common species, of no conservation importance, with partial presence of invasive species, important only for local condition
Moderate	Well-represented habitats with common species and species of conservation importance, important only for the immediate neighbourhood of the local zone
High	Habitats representing species of conservation importance, rare elements, rich in flora and fauna, important for regional/national interests
Very high	Protected habitats with rare species, rich in flora and fauna, important for national/international interests

Table no. 65 - Classification of the magnitude of impacts on biodiversity

Magnitude	Characteristics
Very low	Undetectable impact on habitat integrity, no detectable effect due to disturbance of species behaviour or interactions, immediate return to the conditions existing upon the completion of restoration activities, no impact on an area protected by national legislation, European/international conventions, no disturbance of biotope area or extent, 0-10% of species extinction or reduction of local populations by the same percentage
Low	The loss of habitat integrity cannot be measured using standard techniques, disturbance of species behaviour or interactions detectable using standard techniques, return to existing conditions within 2 years of completion of restoration activities, activities may temporarily disturb protected areas but will not lead to long-term effects on the ecological integrity of the protected area, reduction in the quality of the species habitat (fauna), extinction of 11-25% of the species or reduction of local populations by the same percentage
Moderate	Reduced integrity of regionally important habitat using standard techniques, disturbance of behaviour or interactions of regionally important species detectable using standard techniques, return to existing conditions within 2-5 years after completion of restoration activities, potential to reduce very high impact; assumed restoration of natural setting in 3 years, reduced reproductive success with reduced populations, 26-50% of species extinct or local populations reduced by the same percentage
High	Reduced integrity of the nationally important habitat using standard techniques, disturbance to the behaviour or interactions of populations of nationally important species detectable using standard techniques, return to existing

Magnitude	Characteristics
	conditions within 5-10 years after completion of restoration activities, potential to violate national legislation or international conventions, mitigation measures will contribute to complete restoration of the natural environment within 5 years, reduced viability or population size, 51-75% of species extinct or local populations reduced by the same percentage
Very high	Reduced integrity of internationally important habitat using standard techniques, disturbance to the behaviour or interactions of populations of internationally important species detectable using standard techniques, return to existing conditions >10 years after completion of restoration activities, contrary to national legislation or international conventions, mortality of individuals, 76-100% of species extinct or reduction of local populations by the same percentage

Table no. 66 - Classification of landscape importance/sensitivity

Importance/ sensitivity of receptor	Characteristics
Very low	Landscape dominated by abandoned, disused or degraded man-made structures and/or of no value to local communities or other persons; A natural landscape severely degraded or modified by land uses such as intensive agriculture or overgrazing activities. For people in the project area, the landscape has no aesthetic value.
Low	Landscape with few intact or distinctive natural or historical features, but which is valued at the settlement/community/municipality level (e.g. attracts local tourists); Landscape with modern, dominant, numerous and/or noisy anthropogenic features; A natural landscape degraded or modified by land use, such as agricultural or grazing activities For people in the project area, the landscape represents access to work or industrial facilities
Moderate	Landscape with a range of distinctive natural landforms or historic/traditional features that add value and where modern man-made features may be present but do not significantly degrade the landscape; Anthropized landscape, with a higher sensitivity to change due to the presence of features such as gardens, grasslands, etc.; The presence of a settlement that is locally/regionally important (e.g. attracts tourists from neighbouring localities/region). For people crossing the area affected by the project using fast means of transport (cars, trains), the visual impact is sporadic and on the short-term; Affecting persons during outdoor recreation, where landscape is not an important factor
High	Landscape valued or designated for its national importance (e.g. attracts tourists from other parts of the country); A natural landscape or landscape dominated by traditional/historical features, from which modern man-made structures are absent. Affecting people: residents and/or people enjoying outdoor recreational activities where landscape appearance is important or an integral part of such activities
Very high	Landscape recognised or designated for its international importance; Wild landscape or other landscape type with a very high degree of conservation, difficult to access or isolated, not characterised by anthropogenic features. Affecting houses and hotels specifically positioned/located to take advantage of the view

Table no. 67- Classification of the magnitude of impacts on landscape

Magnitude	Characteristics
Very low	A small or imperceptible change in landscape components or the introduction of a new element that is in line with the surrounding environment / does not cause any noticeable change to the existing view
Low	The development results in minor alterations to the existing landscape, without affecting the overall quality of the views; Minor permanent change to the landscape - new elements fit into the landscape

Magnitude	Characteristics
	and the landscape quality is maintained; Temporary modification of the landscape, with restoration / return to its original state in an estimated period of 1-2 years.
Moderate	The development results in an obvious change to the existing landscape, which visibly affects the quality and/or appearance of the view; Permanent changes to the landscape over a small area - new elements may be visible but do not significantly affect the quality of the existing landscape; Temporary modification of the landscape, with its return to its original state within 2-5 years
High	The development of the project results in obvious changes to the existing landscape, causing significant changes in the quality and/or appearance of the view; Permanent alterations to the existing landscape over a large area, which will result in significant negative changes to its appearance (for example, due to the loss of key elements of the existing landscape or the introduction of elements that are uncharacteristic compared to the original appearance); Temporary modification of the landscape, with its return to its original state within 5-10 years
Very high	The project will dominate the landscape or result in a dramatic change in the quality and/or appearance of the view; Permanent change over a large area and/or introduction of elements that will fundamentally change the appearance of the landscape; Temporary modification of the landscape, with its return to its original state in more than 10 years.

Table no. 68 - Classification of population importance/sensitivity

Importance/ sensitivity of receptor	Characteristics
Very low	Individuals, households or communities using land affected by the project have access to nearby alternatives whose use does not cause adverse indirect effects; An increased labour force of skilled and experienced personnel; The threats to health and well-being are well understood by the population living and working in the neighbourhood of the project implementation area;
Low	Property owners or households using the land affected by the project have access to nearby alternatives, the use of which causes limited, but negative, indirect adverse effects; Increased labour force, but without relevant experience; Few stakeholders in the area affected by the project express concern about its impact on a small number of communities.
Moderate	Owners or households using the resources affected by the project have no nearby alternatives; Limited labour force with limited experience; Some households and landowners perceive that a change will affect their ability to keep their livelihoods, to store resources or keep their quality for a significant period of time (> 1 year); A number of stakeholders in the area affected by the project express concern about its impact on local communities.
High	The local community depends on the affected resources, and there are no alternatives in the immediate neighbourhood; Many households and entrepreneurs perceive that the change will affect their ability to maintain their livelihoods or quality of life to an unacceptable extent; A number of stakeholders in the project-affected area and NGOs express a high level of concern about the project's impact on local communities
Very high	Several communities depend on the affected resources, and there are no alternatives in the immediate neighbourhood; Lack of experienced and skilled labour; Many households and entrepreneurs perceive that the change will affect their ability to maintain their livelihoods or quality of life to an unacceptable extent and there is a possibility that they may leave the area/community; A number of stakeholders in the project affected area and NGOs are expressing

	extremely high levels of concern about the project's impact on local communities.

Table 69 - Classification of the magnitude of impacts on population

Magnitude	Characteristics
Beneficial	Increased ability of residents, households, enterprises or communities to maintain or improve their livelihoods through increased labour opportunities and increased per capita incomes; the emergence of opportunities to develop local businesses; Improving quality of life for local communities
Very low	Short-term (<6 months) inconvenience / decrease in business development opportunities and risk of households or residents losing their income, i.e. reduced economic opportunities in the project area.
Low	Temporary (<1 year) negative changes in business development opportunities and the risk of households or residents losing their income, i.e. reduced economic opportunities in the project-affected area, but to which most individuals/households are expected to be able to adapt relatively easily
Moderate	Job loss and the negative effects on the way of life in a community able to adapt and offer alternative employment opportunities in the short to medium term (within 1 year after job loss).
High	Loss of jobs and livelihoods in small communities with limited alternative opportunities in the near to medium term (within 1 year of job loss); Changes that have a differentiated adverse effect on the livelihoods or work opportunities of vulnerable groups (disabled, elderly, refugees, female-headed households and those living below officially defined poverty levels); The community (or communities) may be able to adjust to job losses and/or income reductions, but the transition period will be difficult for most individuals/households; Medium and long-term (>1 year) financial losses for local business ownership, where recovery may be difficult.
Very high	Local businesses close due to loss of revenue or are relocated; Significant loss of jobs and livelihoods in communities (>30% of them) with no local alternative opportunities in the medium-short term (within 1 year of job loss) other than migration; Widespread perception of adverse effects and/or missed opportunities to improve quality of life, resulting in frustration and disappointment, leading to increased migration and threats to community integrity and viability; Permanent reduction in quality of life.

Table no. 70 - Classification of human health importance/sensitivity

Importance/ sensitivity of receptor	Characteristics
Very low	Temporary housing, heavily anthropized areas. Occurrence of short-term, isolated discomfort to residents due to noise, odours, etc.
Low	Residential areas, industrial zones; Some disruption to local operations for less than 24 hours; There may be isolated, short-term complaints from residents about noise, odours, etc.
Moderate	Urban neighbouring areas; Change in morbidity rate by 10-30% compared to baseline;
High	Rural/urban residential areas where there are no significant sources of pollution; 30% change in morbidity rate compared to baseline
Very high	Residential areas with high density of schools, hospitals, housing, parks; Significant emissions of pollutants with direct impact on neighbouring communities

Table no. 71 - Classification of the magnitude of impacts on human health

Magnitude	Characteristics
Beneficial	Reducing/eliminating risk factors that create discomfort to the population in the

Magnitude	Characteristics
	project area.
Very low	No risk to human health
Low	Occurrence of medium and long-term risks that do not lead to increased morbidity rates
Moderate	Occurrence of medium and long-term risks that may lead to increased morbidity rates.
High	Occurrence of long-term risks that can lead to increased morbidity rates.
Very high	Occurrence of significant risks (explosions, fires, etc.) leading to illness and/or death among the population

Table no. 72 - Classification of importance/sensitivity of material assets

Importance/ sensitivity of receptor	Characteristics
Very low	Assets and services of low/no importance.
Low	Assets and services of little local importance
Moderate	Assets and services of medium importance and many alternatives for replacement.
High	Assets and services with high importance and few alternatives for replacement
Very high	Assets and services of essential importance and very few alternatives for replacement

Table no. 73 - Classification of the magnitude of impacts on material assets

Magnitude	Characteristics
	Increased capacity of local people to improve their quality of life with the help of the project
Very low	Affecting assets and services of low/no importance
Low	Affecting assets and services of low local importance.
Moderate	Affecting assets and services of medium importance.
High	Affecting critical assets and services
Very high	Affecting essential assets and services.

Table no. 74 - Classification of the importance/sensitivity of cultural heritage

Importance/ sensitivity of receptor	Characteristics
Very low	Sites of very low archaeological interest, e.g. sites that have previously been heavily damaged or destroyed
Low	Archaeological sites of local importance; Sites of low value but with the potential to contribute to local research objectives, e.g. sites that have been damaged or are under threat of destruction by agricultural activities
Moderate	Regionally important sites or sites contributing to regional research objectives.
High	Sites protected under national legislation, sites that are on the list of protected monuments; Sites that can contribute significantly to national research objectives.
Very high	UNESCO sites, designated for their cultural, historical or archaeological value; Sites likely to contribute significantly to internationally recognised research objectives
Unknown	The importance of the site is not currently known because there is insufficient data to determine it

Table no. 75 - Classification of the magnitude of impacts on cultural heritage

Magnitude	Characteristics
Beneficial	Unknown or known sites that have not been previously investigated and for which it is estimated that investigation or research as a result of the project will

Magnitude	Characteristics
	lead to an increase in information/knowledge about them. No physical modification of the site or its assets. Applies to sites in the study corridor outside the direct footprint of the project
Very low	Minor alterations to archaeological materials or site setting (visible environment around the site or feature) (<10% of present materials damaged or destroyed).
Low	Alterations to key archaeological materials, such that cultural are slightly damaged (10-25% of present materials damaged or destroyed);assets Slight changes to the initial setting.
Moderate	Alterations to many key archaeological materials, so that cultural assets are clearly altered (25-50% of present materials damaged or destroyed); Considerable changes to the original setting, affecting the character of the archaeological material
High	Alterations to most of the key archaeological material, so that the cultural artefacts are significantly altered (50-75% of the present material damaged or destroyed) Extensive changes to the initial setting.
Very high	Alterations to most or all of the key archaeological material, such that the cultural artefacts are significantly altered (75-100% of the present material damaged or destroyed) Large-scale changes to the initial setting
Unknown	Existing data about the site or the nature of the construction activities do not allow the likely effects to be established at this stage

During the process of assessing the forms of impact (direct, indirect, secondary, cumulative) there were a number of uncertainties related to the absence of precise data on the analysed project, the status of the components possibly affected by it or on the characteristics of other existing or planned projects in the project area.

During the preparation of the report on the impact assessment study for the project "*River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses",* the following difficulties were encountered:

- the level of detail required by the environmental legislation is not fully correlated with the national construction legislation, given that much of the information required, such as, for example, the identification and analysis of alternatives for site organisation, borrow pits or construction waste pits is done at the Feasibility Study stage only at the level of recommendation. Under the current legislation, the determination of land for the location of site organisations, production bases and their organisation, borrow pits and landfills, and other temporarily occupied land is made by the constructors when preparing the tenders, but it may well be the case that land is temporarily occupied during the execution phase, only on the basis of an agreement with the landowner. Thus, at the Feasibility Study stage, where the environmental agreement was requested based on environmental impact assessment studies and appropriate assessment, the level of technical information is not as detailed as in the subsequent Detailed Design stage, where information will already be available regarding the project components, material storage areas, and the list of equipment and machinery required for the execution of the works. All these details were lacking at this stage and did not allow the most accurate estimate of the level of pollutants that may be generated during the works;
- The long-term non-functionality of the websites of the environmental authorities (specifically the Environmental Protection Agencies) has significantly hindered public access to key environmental information. This includes data on the current environmental quality in the areas intersected by the project, ongoing projects under permitting procedures that could generate cumulative impacts with the current project, and other publicly available environmental data.
- The absence of publicly available noise maps in all counties, especially in those relevant to the project, makes it difficult to assess the current state of noise levels in the areas of interest.

- Lack of updated, standardized public health data across all counties of interest impedes the ability to evaluate the population's health status consistently.
- Lack of access to public data related to flood zones on the website www.hartiinundatii.ro - cycle 1, a non-functional page that should allow free access to information;
- At the time of preparation of this report, there was no consistency in the environmental data provided by different county-level Environmental Protection Agencies. For example, some agencies published data for 2023, while others were still presenting only 2022 data. This lack of consistency made it impossible to standardize the assessment of the current environmental status across the three counties involved in the study. Additionally, many of the datasets included in the Environmental Status Reports are outdated, incomplete, irrelevant, or entirely missing For example, the EPA of Călărași does not provide information on protected natural areas within the county, and up-to-date details cannot be found on the websites of other relevant public environmental authorities (such as the National Agency for Protected Natural Areas or the Ministry for Environment, Water and Forests);
- There is a lack of electronic maps/spatial data in compliance with the INSPIRE Directive regarding the quality of surface and ground water bodies, as well as their distribution and locations - data critical to accurately assess the project's placement within the river basin.

All these issues complicate the impact assessment process, making it difficult in some cases to estimate the actual environmental impact of the project To anticipate and address these uncertainties, the assessment considered worst-case scenarios.

The residual impact is defined as the impact that remains after all possible preventive and mitigation measures have been implemented. By conducting periodic monitoring of the quality of the environmental factors affected by the project, it will be possible to check the effectiveness of the adopted mitigation measures and to assess the residual impact generated by the project.

8. Description of the measures proposed to avoid, prevent, mitigate or, if possible, compensate for any significant adverse environmental effects identified

8.1 Measures proposed to prevent/avoid/reduce impacts on water

8.1.1. Period of execution of the works

The impact of the proposed project is expected primarily during the construction period. The proposed works, as described in this study, are part of the measure to develop the Argeș and Dâmbovița Rivers for navigation and other uses, so that surface waters do not require additional protection measures beyond those needed during construction, aimed at reducing the emission of dust that could reach the water surface, possible leakage of hydrocarbon-containing products that could reach the water bodies from the machinery/equipment used, increased turbidity during dredging and other in-water works.

In order to mitigate dust emissions that may reach the water surface, the Contractor carrying out the works will ensure that during periods of high wind intensity, operations that generate particulate matter are not carried out and will use methods of execution that minimise dust emissions.

Among the potential sources of pollution mentioned, those leading to increased turbidity in river waters are inevitable. Other sources can be eliminated or limited by management measures. For example, as part of the organisation of the work places/work zones, the contractor must provide retention toilets (to be cleaned regularly by an authorised operator).

To minimise or eliminate the effects of these sources, the following recommendations are made:

- the platforms for the storage of materials (aggregates, cement, binders, and other types of materials) must be enclosed or covered and provided with perimeter trenches so that there is no danger of fine particles being released into the atmosphere and deposited on the ground and in the

water. This eliminates the risk of these particles reaching into groundwater via rainwater or into the Danube.

- Proper maintenance of machinery and performing oil changes at special oil and grease change stations as oils and greases are highly polluting. Fuels and chemicals must be stored in sealed containers.
- It is recommended to grade and systematize the entire worksite area so that all stormwater can undergo preliminary mechanical treatment, preventing rainwater runoff from washing off petroleum residues from construction machinery into surface water bodies
- work crews will be responsible, at the end of each workday, for cleaning the work platform and collecting household waste into designated bins. This procedure will minimize or even eliminate the risk of surface water pollution.
- the worksite shall be equipped with absorbent barriers or similar containment equipment designed to capture petroleum products from potential leaks (such as fuel leaks during equipment operation)
- for works to be carried out on dry land, organizational and managerial measures are considered the only effective means to reduce the impact on surface water bodies to a minimum.

To reduce the ecological impact on water and associated aquatic ecosystems during the construction phase, the following measures are recommended:

- avoid biogenic, organic and toxic chemical inputs. This will be done by connecting to the ports' sewerage network or by using retention toilets, which will be emptied in places specially designated by the environmental authorities;
- ensure proper maintenance of machinery to avoid loss of petroleum products or lubricants.
- strictly adhere to the excavation technology as specified in the project documentation, and monitor all implementation phases to avoid uncontrolled situations that may trigger environmental emergencies.

Specialist designers will provide periodic on-site supervision throughout the construction works, under a technical assistance agreement concluded with the project beneficiary, to ensure adaptation of works to actual field conditions.

The successful implementation and operation of the project depend on compliance with the following key elements:

- respecting the geometric parameters and alignment as per detailed design and layout plans;
- using materials that comply with technical specifications;
- enforcing occupational health and safety regulations in accordance with applicable legal provisions;
- implementing a structural monitoring program, overseen by the beneficiary, with timely notification to the designer in case of incidents requiring urgent intervention;
- drawing up operating procedures in cooperation with the designer.

To ensure the protection, stabilization, and reinforcement of embankments adjacent to water bodies, the following are foreseen:

- toe protections for embankments consisting of flexible mattresses made of prefabricated concrete, covered with raw stone, or fascine mattresses filled with raw stone, aimed at ensuring slope stability;
- defence works on the inner slopes of dykes aimed at protecting against hydrodynamic stresses consisting of drainage layers overlaid with an impermeable concrete revetment, in sections where the water level is below the natural ground level. Above the waterline, embankment protection will be ensured using reinforced concrete prefabricated slabs.

In order to reduce the exfiltration flow under the foundation of the dykes, cut-off walls made using a

Kelly bar or thin concrete diaphragms will be built from ground level up to the embedment in the foundation layer.

To protect land and settlements against flooding, frontal drainage along the dykes and a counter-channel will be constructed.

Surface water collected from outer slopes and adjacent low-lying areas will be drained through ditches. In special cases, water from the areas adjacent to the development will be evacuated using pumping stations.

Both during the execution of the works and afterwards, during operation, it is necessary to implement a Pollution Incident Response Plan (PIRP). According to this plan, an intervention team, adequately and regularly trained, will be nominate, which will be able to intervene with the necessary technical and logistical means (to be made available through the PIRP) to limit / reduce the potential environmental impact of an accidental spill of products containing hazardous chemicals or any other environmental incident (included in the plan) that could potentially affect water bodies.

By implementing the above-listed measures, as well as those proposed below, the environmental impact during the construction phase is expected to be minimal, with no future implications.

8.1.2. Operation period

The works proposed and analysed within this study aim to develop the Argeș and Dâmbovița rivers for navigation and other uses and therefore, during the operational phase, navigation on these watercourses is not, in itself, a source of pollution that would necessitate the implementation of reduction or prevention measures - except in the event of accidents involving vessels transporting substances/products containing dangerous substances or resulting in the spillage of petroleum products. To address such incidents, it is necessary that during the operational phase, the beneficiary/operator of the canal implements a pollution incident response plan, which should ensure that personnel operating navigable waterways are adequately trained to respond promptly and effectively to mitigate environmental impacts.

For associated activities along the navigable canals, particularly where potential sources of water pollution may exist (as outlined in the previous subchapter), the following measures are recommended:

- placement of waste collection bins on concrete or impermeable platforms in designated areas
- selective waste collection and its management in accordance with applicable legislation, under the responsibility of the beneficiary
- proper management of bilge water from ships docked in port
- maintenance and regular inspection of wastewater collection systems in port areas to prevent malfunctions or ensure their prompt remediation to avoid soil and surface water contamination
- implementation of specific pollution incident response plans in each port to ensure timely intervention aimed at reducing or preventing potential environmental impacts
- development and enforcement of operational management plans throughout the service life of the canal, to prevent or reduce incidents caused by improper handling of canal infrastructure and equipment.

8.1.3. Decommissioning phase

During the decommissioning phase, the works will be similar to those undertaken during the construction phase; therefore, the recommended environmental protection measures are similar.

8.2 Measures proposed to prevent/avoid/reduce impacts on air

8.2.1. Period of execution of the works

To reduce atmospheric pollutant emissions, the following measures will be implemented:

- limiting dust emissions from earthmoving activities through:
  - surface wetting;
  - covering vehicles transporting fine materials;
  - limiting the travelling speed of heavy duty vehicles used for the transport of materials;
- storing fine materials in closed or enclosed and covered areas to prevent wind dispersal;
- construction site organisations will be equipped with vehicle washing stations at the exit of the construction site, access road sprinkling within a radius of 100 m around the exit of the construction site, water spraying systems, etc
- refuelling of transport vehicles shall only take place at designated fuelling stations specifically designated for this purpose (refuelling stations), as determined by the Contractor before the start of works;
- the use of machinery and equipment conforming to the best available techniques;
- ensuring proper management of materials used during construction;
- switching off engines of idle equipment
- fuel storage areas must include retention basins covering the full volume of stored products. Fuel storage tanks on the construction site must be equipped with double walls to prevent any accidental spills in the event of malfunctions or cracks. Also the rainwater collection network on the premises of the site organisation must be equipped with a hydrocarbon separator and decanter to prevent the discharge of the water collected here (either into a drainable basin or into the sewerage network without pre-treatment).

Given that concrete and asphalt mixing stations may be present on-site, the measures to be taken for them in particular during the entire period of execution of the works are:

- ❖ for asphalt mixing stations
  - the provision of textile filters at cement storage silos and the leak tightness check of the pneumatic cement unloading/loading plant are mandatory measures to minimise cement losses and to bring the concentrations of particulate matter in the air within legal limits
  - concrete mixing will be carried out using modern technology, with the elevators, weighers-dispensers and mixer located in a perfectly enclosed place
  - inactive material stockpiles must be fenced or covered to prevent wind erosion. Measures will also be adopted to cover storage areas for fine aggregates.
  - periodic watering of aggregate stockpiles is a temporary measure to reduce emissions and is only carried out for aggregates used for the preparation of concrete and stabilized mixtures.
- ❖ modern technology will be used for the preparation of asphalt mixtures, with a mixing plant equipped with filter bags that retain 99.9% of the particles emitted into the atmosphere.

8.2.2. Operation period

During the operational phase, considering road traffic within developed port areas (the primary source of air pollution), the following are recommended:

- the use of appropriate, high-performance machinery/means of transport complying with EURO standards;
- regularly checking of the technical condition of machinery and means of transport;
- regular spraying of access paths to minimise dust pollution (where appropriate);
- the use of tarpaulin-covered tippers for the transport of powdery materials, susceptible to wind drift;

- use of tarpaulins to protect temporary storage areas from wind exposure;
- monitoring of particulate pollution levels.

Maintenance and repair works will follow the same mitigation measures as during the construction phase.

8.2.3. Decommissioning phase

During the decommissioning phase, the works will be similar to those undertaken during the construction phase; therefore, the recommended environmental protection measures are similar.

8.3 Measures proposed to prevent/avoid/reduce impacts of noise and vibration

8.3.1. Period of execution of the works

The use of modern equipment/machinery/vehicles equipped with noise reduction systems is recommended during the works. Also on the sites where the works are carried out near residential areas, it is necessary to use mobile sound-absorbing panels and/or to arrange material stockpiles as protective walls to minimise the dispersion of noise waves towards these residential areas.

It is also necessary to respect the hours of rest during the night between 10 pm - 6 am and to respect the works execution schedule.

In order to minimise as much as possible the noise level and discomfort for the population in residential areas through which the vehicles transporting the materials will pass, it is necessary to establish the route before the start of the works and to avoid as far as possible crossing residential areas. Where such avoidance is not feasible, reduced speeds (max. 30 km/h) shall be observed within populated areas

8.3.2. Operation period

During the period of operation / commissioning, the static nature of the planned works is such that they do not produce noise and vibrations.

Noise from ship and road traffic will be the main source of noise pollution in the area. In the absence of results of sound level measurements for similar situations, it is not possible to estimate the amount of traffic noise in the area and at sensitive points. Sensitive points are defined as points where objectives protected by regulations are located, aimed at limiting human exposure to noise and vibration. There is no such situation in this case.

8.3.3. Decommissioning phase

During the decommissioning phase, the works will be similar to those undertaken during the construction phase; therefore, the recommended environmental protection measures are similar.

8.4 Measures proposed to prevent/avoid/reduce impacts on soil

8.4.1. Period of execution of the works

Topsoil will be removed out to the extent strictly necessary to a thickness of about 10 cm, with the topsoil being stored so that it could be reapplied subsequently on slopes or reused for landscaping.

The land occupied by the temporary warehouses will also be reduced to the minimum.

The location of borrow pits will be chosen in such a way that the environmental impact of the excavation is minimised and the distance travelled to the construction site is kept as short as possible.

Areas where excavated material has been deposited will be redeveloped upon completion of the works and returned to agricultural use.

Re-circulation measures are difficult because the remaining excavations cannot be completely filled.

Earthworks and sloping works will be performed, as well as the levelling of the base, so as to ensure slopes of 1:4 - 1:5. Later, these pits can be used as environmentally friendly landfills.

Differentiated defence, protection and consolidation solutions were proposed for the protection of embankments in the form of:

- defences at the foot of the slope to ensure the stability of the base of the section, in the form of a rockfill prism on a fascine mattress, or flexible reinforced concrete mattresses, depending on the water level during the period until the works are completed;
- defence works on the inner slopes to cope with the hydrodynamic stresses of the water in the form of drainage layers overlaid with a reinforced concrete impermeable revetment on the slope, or precast slabs are used where an impervious revetment is not necessary.

On the sectors where the water level in the project's reaches exceeds the level of the surrounding land, with possible exfiltration from the canal and flooding of the neighbouring land, impervious protections were provided.

In order to reduce the exfiltration flow under the foundations of the dams, the solution of concrete cut-off wall or bentonite-based concrete made from specially designed horizontal working platforms was studied and proposed for implementation.

On slope surfaces above the water level with a 1% exceedance probability (i.e. NRL + 1.80 m clearance), a light defence solution was provided with linear prefabricated cores placed on a cross-cut pattern, and the space between them is filled with earth, which is then grassed.

A ***frontal drainage*** was designed for intercepting exfiltration (seepage) flows. It is planned for impounded sections where the normal retention level is located above the surrounding terrain, and where local lithological and hydrogeological conditions allow such seepage to occur.

The frontal drainage system captures exfiltration from the impounded river and has been designed as a closed collector system, with drainage pits and filter columns totalling 74,600 m.

The counterchannel will ensure the evacuation of water collected from drainage mattresses/arms at the base of the dykes, as well as stormwater runoff from depression areas or from not surveyed valleys and slopes.

The restoration of the system for collecting, channelling and discharging water into the canal will also have a positive effect on the stability and quality of the soil in the area.

Other measures proposed at this stage are:

- in terms of site organisation, priority will be given to solutions that minimise the surface area.
- soil pollution with oils and petroleum products will be avoided by ensuring the proper functioning of machinery and carrying out maintenance operations in specially designated areas.
- avoid the direct placement of construction materials and construction waste on the ground.
- temporary on-site storage of waste resulting from the works, as well as household waste, until its collection by specialised firms for final disposal or recovery, will be carried out in appropriate containers in specially designated premises;
- collecting and discharging stormwater to avoid its mixing with sediment-containing waters;
- the use of technically appropriate vehicles for the execution of the works, as well as for the transport of materials and for the collection and transport of construction waste;
- maintenance, refuelling or cleaning of vehicles and machinery will be carried out in specially designated areas away from sensitive areas or on the premises of the site organisation;
- strict compliance with rules on waste management, distribution and fuelling, wastewater disposal and emptying of retention toilets;
- in the case of soil contamination, the affected portion will be removed and treated/disposed of according to the type of contamination; the site organisation will be adequately equipped with specific absorbent materials for each type of material/substance that may cause pollution as a result of improper management.

With regard to the use of natural resources, during the execution of the works it is prohibited to exploit natural resources within national protected areas that are in the neighbourhoods of the project or are intersected by the project site.

In order to minimise the amount of demolition waste that needs to be removed from the site, it is recommended to use these materials (from the crushing of demolition waste) as backfill or for waterproofing of access roads, etc.

For the stone required to be used in the works area, it will be sourced (like the rest of the materials) only from authorised operators.

As specified in previous chapters in the soil description (chapter 4.4. Soil), in order to have a picture of the soil quality before the execution of the works, to be able to compare throughout the execution period how the soil quality changes or not as a result of the activities carried out in the site organisation / work zones, it is recommended to take soil samples and to have them tested by an accredited laboratory. The points where we recommend sampling are the areas proposed for the site organisation, material stockpiles.

8.4.2. Operation period

During the period of operation / commissioning, the static nature of the planned works does not generate soil pollution.

In port areas, activities will be carried out in port enclosures, which will be concreted / waterproofed so that there will be no sources of soil pollution.

8.4.3. Decommissioning phase

During the decommissioning phase, the works will be similar to those undertaken during the construction phase; therefore, the recommended environmental protection measures are similar.

8.5 Measures proposed to prevent/avoid/reduce impacts on biodiversity

As analysed in section 6.6.4, several forms of impacts of the project on biodiversity have been identified with different magnitudes, ranging from negative, negligible/moderate to positive.

In addition to these forms of impacts, undesirable aspects with moderate-major impact magnitudes have been identified, which are **recommended to be addressed at the design stage**, as follows:

1. Deviation of the proposed route of the navigable canal in the area of Tătaru fish farm, in Plătărești (biodiversity zone 2), on the current course of the Dâmbovița river or within 20-50 m from it, in order to avoid deforestation and damage to the lake body with adjacent vegetation. Location: km 16+300, Dâmbovița river, Tătaru Lake, fish farm and forest, Plătărești.

2. Design of special constructions for the downstream migration of ichthyofauna on both courses of the Argeș and Dâmbovița rivers. At the time of preparation of the present documentation, the feasibility study proposed the solution of locks for navigation as sufficient to preserve the longitudinal continuity of the water bodies. As argued in 6.6.4, this solution is not sufficient.

Tables 76-77 present the measures to prevent/avoid/reduce the impact of the project on biodiversity and the recommended timetable for implementation of these measures in the construction/operational phases.

Table 76 - Measures to prevent/avoid/reduce (P/A/R) negative impacts on biodiversity

Measure code	Measure - description	Type of measure (P/A/R)	Species / habitat affected	Project stage	Location of implementation of the measure
M1	Removal of vegetation/thatching will be carried out during the vegetation break - during the cold period of the year, according to the recommended schedule	P	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of conservation importance	Construction	Entire project
M2	Existing strips of meadow forest of at least 15-25 metres wide along the banks of the Dâmbovița and Argeș rivers, the slopes of which are restored by concreting, will be maintained by planting or preserving them. Particular attention will be paid to the restoration of terrestrial habitats in the **8 biodiversity hotspots** specified in the document. Re-vegetation, replanting of trees/shrubs and landscaping will be done only using species characteristic of the deforested areas or of the habitat 92A0 *Salix alba* and *Populus alba* galleries in natural areas or with other species of the local flora in anthropized areas (ports, nodes, etc.). The replanting/sowing with alien and locally invasive plant species is prohibited.	P/A	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of conservation importance	Construction / operation	Entire project
M3	Implementation of a programme to control invasive flora and fauna species during the operational period: identification of the presence of alien and local invasive species, which may develop/spread on the land surfaces within the project perimeter and their elimination by environmentally friendly, ecological means.	P/A	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of conservation importance	Operation	Entire project
M4	Prohibition of works in riverbeds and on river banks at a lateral distance of about 100 m during the period of biodiversity reproduction: March - June, to prevent disturbance of common fauna species or species of conservation importance, according to the recommended timetable.	P/A/R	All common fauna species or those of conservation importance	Construction	Entire project
M5	Prohibition of rehabilitation works on existing concrete ground superstructures during the chiropters (bat) breeding season: June - September, as well as during the hibernation period: November - February, according to the recommended calendar.	A/R	All chiropteran species	Construction	Rehabilitation of concrete structures - Oltenița sector - km 0+100-2+500
M6	Periodic inspection (and in particular before the works start) in order to detect fauna of Community interest that may be present or occasionally	P	All fauna species of conservation importance	Construction	Entire project

Measure code	Measure - description	Type of measure (P/A/R)	Species / habitat affected	Project stage	Location of implementation of the measure
	pass through the area. Prohibition of the capture, removal and destruction of wildlife species by personnel carrying out the works.				
M7	Translocation of the entire removed vegetative layer of *Marsilea quadrifolia* from the area of the HN1 of Oltenița - Falaștoaca lock to the meander area of ROSPA0038 Oltenița - Chirnogi in the summer period, according to the recommended timetable.	R	*Marsilea quadrifolia*	Construction	HN1 of Oltenița - Falaștoaca lock - km 3+600 - km 5+100, Argeș river
M8	Maintaining a naturalised floodplain in the Ring Road-Glina area, with reed, permanent shallow (20-40 cm) pools and small sand and gravel islands, so that the area provides the necessary conditions for bird species of Community importance; the proposed conservation area will be delimited from the navigable canal, but the link will be provided by valves that can provide the necessary water flow.	R	All fauna species of conservation importance	Construction / operation	km 30+300, Dâmbovița river, Glina Delta
M9	Shallow water bodies/natural pools for the attraction/reproduction of amphibian species will be provided/maintained in the area of meadow forests on the river banks. They will be supplied with water from the Argeș and Dâmbovița rivers by various methods; the recommendation is to supply it from the groundwater of the two rivers.	R	All amphibian species	Construction / operation	Entire project
M10	Staging the works and avoiding the overlapping of several high intensity noise sources. Staging of dust-generating operations, reducing the level of dust concentrations in the atmosphere below the limit value for the protection of ecosystems.	P	All fauna species of conservation importance	Construction	Entire project
M11	Appropriate management of waste and sludge from dredging: collection, recovery and transport to specialised sites/units, collection and rhythmical disposal of household and technological waste in order not to attract animals and avoid the risk of animals becoming ill and being injured. Periodical collection of waste from the project perimeter to eradicate invasive fauna species.	P/A	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of conservation importance	Construction / operation	Entire project
M12	Deviation of the proposed route of the navigable canal from the **biodiversity zone 2,** Tătaru fish farm, Plătărești, on the current course of the Dâmbovița river or within 20-50 m from it, in order to avoid deforestation and damage to the lake body by adjacent vegetation.	R	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of	**Design Department**	Km 16+300, Dâmbovița river, Tătaru Lake, fish farm and forest, Plătărești locality

Measure code	Measure - description	Type of measure (P/A/R)	Species / habitat affected	Project stage	Location of implementation of the measure
			conservation importance		
M13	Design of special constructions for the downstream migration of ichthyofauna on both courses of the Argeș and Dâmbovița rivers.	R	Ichthyofauna	**Design**	Entire project

Table no. 77 - Timetable for implementation of measures to prevent/avoid/reduce (P/A/R) negative impacts on biodiversity

Measure	Affected species/habitat	Parameter to which the measure is addressed	Project stage		Annual timetable for implementation of measures											
			Construction	Operation	1	2	3	4	5	6	7	8	9	10	11	12
M1	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of conservation importance	Eradication of the spread of invasive species/Habitats for various common fauna species or fauna species of conservation importance	X	-	-	-	X	X	X	X	X	X	X	-	-	-
M2	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of conservation importance	Eradicate the spread of invasive species/ restore the phytokenotic composition of habitat 92A0	X	-	-	-	X	X	X	X	X	X	X	X	-	-
M3	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of conservation importance	Eradicate the spread of invasive species/ restore the phytokenotic composition of habitat 92A0	-	X	-	-	X	X	X	X	X	X	X	X	-	-
M4	All common fauna species or those of conservation importance	Breeding/resting and feeding habitats for various fauna species of common or conservation importance	X	-	-	-	X	X	X	X	-	-	-	-	-	-

Measure	Affected species/habitat	Parameter to which the measure is addressed	Project stage		Annual timetable for implementation of measures											
			Construction	Operation	1	2	3	4	5	6	7	8	9	10	11	12
M5	All chiropteran species	Breeding/hibernation habitats	X	-	X	X	-	-	-	X	X	X	X	-	X	X
M6	All fauna species of conservation importance	Habitats for fauna species of conservation importance	X	-	X	X	X	X	X	X	X	X	X	X	X	X
M7	*Marsilea quadrifolia*	Habitat of the species	X	-	-	-	-	-	x	x	-	-	x	-	-	-
M8	All fauna species of conservation importance	Habitats for various common fauna species or fauna species of conservation importance	X	X	X	X	X	X	X	X	X	X	X	X	X	X
M9	All amphibian species	Habitats for various common fauna species or fauna species of conservation importance	X	X	X	X	X	X	X	X	X	X	X	X	X	X
M10	All fauna species of conservation importance	Habitats for various common fauna species or fauna species of conservation importance	X	-	X	X	X	X	X	X	X	X	X	X	X	X
M11	Areas cleared / removal of spontaneous vegetation / All common fauna species or fauna species of conservation importance	Eradicating the spread of invasive species / Habitats for various common fauna species or fauna species of conservation importance	X	X	X	X	X	X	X	X	X	X	X	X	X	X

8.6 Measures proposed to prevent/avoid/reduce impacts on population

The objectives on reducing the exposure of the population to noise and pollutants are met through the measures considered for the environmental factors noise, water and air. Another way of minimising the impact on the population and public health is to locate the project in an area more than 0.500 km away from the residential area. Thus, for the study area, the nearest residential area is located more than 0.500 km from the project site, which is sufficient distance for the population not to feel the effects of noise and vibration produced during the construction phase.

In order to prevent and ameliorate the pollution of human settlements in the area adjacent to the project, access roads to/from the analysed perimeter, during the transport of materials, for the entire duration of the execution of the planned construction works, it is necessary to cover the tippers with tarpaulins during the transport of dust-generating materials and/or their wetting; to spray the materials in the storage area and the roadway (car parks for access to the work perimeters and the outer areas); to restrict the speed of tippers to 25 - 30 km/h. All machinery and equipment used in construction works must comply with the requirements of Directive 2000/14/EC on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors.

It is also necessary to ensure traffic management during the works, with a focus on the urban areas.

During the execution of the works, rest hours must be observed at night between 10 pm and 7 am.

In order to prevent the spreading of dust and, consequently, of suspended particles both on the access roads from the site organisations and from the work zones, it is necessary to carry out daily cleaning of these access roads and maintain them.

Work areas (work zones, material storage areas, etc.) must be properly fenced off, lit at night to avoid accidents, and access must also be restricted.

Site organisations must also be delimited, adequately lit, properly signposted and the access of outsiders/unauthorised persons must be restricted to avoid accidents.

Work zones will be provided with mobile sanitary installations, with chemical neutralization or septic tanks periodically vacuumed by an authorised operator.

Where the situation makes it necessary and there are complaints from the population in the riverside areas about increased noise levels during the works, mobile sound-absorbing panels will be used.

A form of positive impact on the population during both the works execution and operation periods is the increase in the number of jobs, which will also lead to an increase in the economy, and to maintain this form of positive impact the employment of staff from the riverside areas must be encouraged.

With regard to the HN of Cucuieți, taking into account what has been mentioned in the previous chapters of the impact assessment by the construction of the hydrotechnical node, the dump for the storage of dredged material, the clearance of the forest area and the generation of a major impact in this area of the project site, in order to reduce the generated impact to a lower class than the estimated one, it is necessary to consider a technical alternative for the proposal of a different location for the disposal dump and the hydrotechnical node, which does not imply the clearance of the Tătaru forest area and Lake, preserving a landscape close to the existing one.

8.7 Measures to prevent/avoid impacts of climate change

Extreme weather events are increasingly linked to climate change.

Thus, it is necessary to identify the impacts of climate change on natural and anthropogenic systems, the vulnerability of these systems as well as adaptation to the effects of climate change.

Vulnerability involves analysing the adverse impacts of climate change, including climate variability and extreme weather events, on natural and anthropogenic systems and depends on the type, amplitude and rate of climate variability to which they are exposed and their ability to adapt.

Vulnerability - the negative impacts of climate change, including climate variability and extreme weather events, on natural and anthropogenic systems. Vulnerability depends on the type, magnitude and rate of climate variability to which a system is exposed and its capacity to adapt

Adaptation to the impacts of climate change is the capacity of natural and anthropogenic systems to respond to the effects of actual or expected climate change, including climate variability and extreme weather events. The aim of adaptation is to minimise potential damage, take advantage of opportunities and respond appropriately to the consequences of climate change, recognising that society and ecosystems experience the individual and cumulative effect of all these components.

Adaptation to the effect of climate change is a complex process, as the severity of impacts varies from region to region, depending on exposure, physical vulnerability, degree of socio-economic development, natural and human adaptive capacity, health services and disaster monitoring mechanisms.

The challenge for adaptation is to increase the resilience of economic and ecological systems and reduce their vulnerability to the impacts of climate change. At the same time, the measures adopted in the area of adaptation to the effects of climate change will maximise the positive effects of the global warming process.

Thus, in order to be able to present the impact that climate change may have on the project that is the subject of this report, potential extreme events caused by weather or climate change on the project will be analysed.

The effects of future climate change pose a significant challenge for infrastructure managers, transport operators and other stakeholders, who may face a number of factors such as: flooding, rising/declining water levels impacting and/or high wind speeds impacting on shipping conditions, flooding or soil erosion impacting on land transport or all on-shore operations, heat waves with the impact these may have on the health of the population, droughts (including low water availability and quality and increasing demand for water), extreme precipitation amounts, floods, storms, high winds, freeze-thaw phenomena, etc.

In order to minimise the risk of climate change impacts of the project it is necessary:

- to comply with the technical provisions of the Technical Design on which this report is based, as well as those of the following stages which will be more detailed from a technical and structural point of view
- to adapt the materials used in the execution of the works to the types of construction works, which must be resistant to temperature variations
- to take into account the details and information from the geotechnical study in order to avoid landslides
- to implement operational plans in case of floods and droughts so that appropriate action can be taken during such periods and vessels on the canal or moored on shore are not affected. The implementation of these plans will also ensure that the people working in the ports and the population in the riverside areas will not suffer either
- to provide appropriate signposting so that during periods of heavy rain, fog, snowfall, it will be possible to avoid accidents / crashes of ships but also in the land area adjacent to the planned hydro-hydrotechnical constructions (roads, railways), which must be properly signposted to avoid accidents leading to material damage and/or loss of human life
- to provide working instructions for staff on site to avoid the occurrence of incidents and/or accidents resulting in material damage and/or loss of life
- to notify any change occurring in operation requiring modifications to the technical design to the authorities
- to ensure the periodic clearing of vegetation in the areas neighbouring the project in order to avoid future vegetation fires.

The project, as described in the previous chapters, will respect the height level in the areas where new construction works will be necessary, so it will not hinder air circulation, a risk that could generate

impacts on other climatic factors (increase in temperature, lack of precipitation) or on the population that will be working in the area of the site or the population in the riparian areas.

The project will not generate any changes in climatic factors, therefore this risk is minimal and does not require action.

9. Description of any proposed monitoring measures

Supervision of the quality of environmental factors and monitoring of activities aimed at environmental protection will be carried out in accordance with the recommendations of the Environmental Protection Agency.

In the event of accidental pollution, the environmental protection authority, the local population and other relevant authorities will be informed immediately after the occurrence of such an event.

During the execution phase, the waste generated and selectively collected will be recorded in accordance with GD 856/2002 and will be handed over to authorised establishments for recovery and/or disposal.

The environmental monitoring will be carried out by the Beneficiary of the works together with the appointed Contractor, through environmental officers/specialists as appropriate. The results of the self-monitoring will be recorded and reported periodically at the request of the environmental authorities.

Table 79 shows the proposed monitoring programme of environmental factors for the period of the project works.

Table no. 78 - Monitoring programme proposed to be implemented for the period of execution of the works

Field	Indicators	Frequency	Responsibilities
Water	- Water quality upstream and downstream of the work zones (physico-chemical parameters: pH, fixed residue, hydrocarbons, dissolved oxygen, nitrites, nitrates, ammonium, total phosphor, heavy metals) - Records of emptying operations at site organisations, work zones - Monitoring of hydrodynamic parameters - Monitoring of morphological parameters - Monitoring of macrobenthos in water bodies - Monitoring of sediment quality - Records of accidental pollution	Monthly	Contractor through the appointed environmental officer and with an accredited laboratory
Air	- Emissions (NOx, NO, SO2, CO, particulate matter) - Imissions (particulate matter, NOx, SO2, VOCs)	Monthly (in the area of work zones, borrow pits, site organisation)	Contractor through the appointed environmental officer and with an accredited laboratory
Soil	- Heavy metals (cadmium, copper, chromium, manganese, nickel, lead, zinc) - Hydrocarbons - pH	Monthly (in the area of work zones, borrow pits, site organisation)	Contractor through the appointed environmental officer and with an accredited laboratory
Noise	- noise level dB(A)	Monthly (in the area of work zones, borrow	Contractor through the appointed

		pits, site organisation)	environmental officer and with an accredited laboratory
Biodiversity	Invasive species, replanting of forests, monitoring of wildlife species in the 8 indicated areas	Quarterly	Contractor by externalising the biodiversity monitoring service by components
Population	- number of complaints registered from the population in the riparian zones	Permanent	Contractor, through the environmental and social officer appointed for this project
Waste management	- quantities of waste / types of waste generated - quantities of waste / types of waste handed over to authorised operators - the amount of earth excavated and removed from the site	Monthly (in the area of work zones, site organisations)	Contractor through the appointed environmental officer

During the operational period, the quality of wastewater discharged from port areas where wastewater collection systems and pre-treatment systems are in place will be monitored prior to discharge, as well as the waste generated (quantities of waste generated / types of waste, quantities of waste handed over for recovery / disposal / types of waste).

Environmental monitoring during both the construction and operation phases of the project will aim to implement additional measures to minimise the impact on the environment in order to respect the principle of sustainable development.

Analyses for water, soil and air samples will be carried out in accredited laboratories, using standardised methods.

The results of the self-monitoring will be recorded and reported periodically to environmental authorities.

10. Description of the project's expected significant adverse effects on the environment caused by the vulnerability of the project to major-accident and/or disaster risks relevant to the project in question

The production in recent years of significant material and human damage due to the effects of destructive natural phenomena such as floods, landslides or earthquakes, recorded in the production areas with increasingly large areas of land spread over almost the entire territory of Romania, in conjunction with the limited promotion of the works and remedial measures proposed in critical areas and the conservation or slow execution of some works, has led to the need to draw up legal provisions aimed at regulating the occupation of these areas and strategies for implementing measures to defend existing or proposed social and economic objectives in these areas.

According to the current legislation on environmental protection, the projects for the investment works analysed, through the proposed sites, need to comply with the requirements of the national urban planning and zoning plans, regarding land use, protection of human settlements and other objectives of public interest, by analysing the risk areas and implicitly the environmental impact that the proposed sites produce.

In this context, the research of these areas is indispensable, and it requires the determination of the risk categories implied by the location of social-economic objectives of major interest for the country's economy (such as the Danube-Bucharest Canal), the application of appropriate measures and/or the proposal of works to stabilise the effects of phenomena that will lead to limiting the damage and their

impact on the environment for existing economic objectives or the protection and encouragement of future investments necessary for economic development in these areas.

10.1 Natural risks (earthquakes, landslides, floods)

Natural risk zones are geographically defined areas within which there is a potential for natural hazards that can cause physical damage and loss of life, affecting people, human activities, the natural and built environment. In order to propose specific measures for the prevention and mitigation of risks in the studied areas, it is necessary to analyse the causes of the phenomena analysed. In the following we will define only the causes that are of interest for the analysed area.

- *Natural causes*:
  - overflowing watercourses caused by heavy rainfall, sudden snow melt
  - rising groundwater levels
  - collapses of geological massifs
- *Anthropogenic causes:*
  - dam bursting or damage to dams and other works located upstream of the site of social and economic objectives designed at a higher level of importance
  - the design of construction works that cross riverbeds (narrowing watercourses) and that do not take into account existing works or works included in river basin management schemes
  - the design of construction works crossing riverbeds designed at inappropriate or out-of-date maximum flows,
  - large-scale deforestation through unregulated logging, etc.

The main concepts that determine the definition of risk areas are:

- *Hazards* - defined as the number of cases of expected occurrence (in a probabilistic sense), during the exposure or observation period, of phenomena that have the potential to cause severe adverse impacts. Hazards can be natural, technological or of a different nature. In addition to natural hazards, it is necessary to consider secondary hazards that are generated in chains of economic and social events that amplify the consequences of natural phenomena.
- *Vulnerability* of the different exposed elements as their susceptibility (in a probabilistic sense) to be affected by the incidence of a severe natural phenomenon (fatalities, construction, disruption or impairment of economic activities). The expected impacts (in a probabilistic sense) are conditioned by the severity of occurrence of the natural phenomena considered.
- The *exposure* of elements to risk is defined as the fraction of the total time they are exposed to certain conditions that make them susceptible to natural events. There are: elements with constant (permanent) exposure such as buildings, elements with variable exposure such as population, etc.
  - *Natural risks* are determined by natural hazards, the vulnerability of exposed elements and their exposure. The law highlights at national level the main natural risk areas determined at a given date (1999), where there is a potential for natural disasters through floods, landslides and earthquakes.
  - *Natural hazards* are considered to be the most important in the conditions of our country, those determined by the following potential phenomena:
    - floods and flash floods
    - landslides
    - earthquakes.

In terms of natural hazards, the following must be considered:

10.1.1. Flood risk

In order to adopt efficient solutions for the regulation of the lower course of the Argeș River, extensive

studies were carried out to determine maximum and minimum water levels under natural conditions and under the modified regime resulting from the impoundment of the Argeș River. The flow velocities calculated for the modified regime, involving embankment and impoundment, under high discharge conditions on the Argeș River, are on the order of 2 to 2.5 m/s, depending on the canal width. These velocities necessitate the implementation of bank protection and stabilization measures.

According to STAS 4068/2-87, the hydraulic design of bridges crossing the Dâmbovița, Sabar, and Ciorogârla rivers, and the Câlnău and Bâldana streams, was performed for a 2% exceedance probability. For the Dâmbovița River, a navigation clearance of 11.00 meters in height was ensured.

The construction of contour dikes for the impoundment steps is intended to safely convey peak discharges corresponding to importance class II, and to protect social and economic assets located within flood-prone areas. According to previous studies, these include approximately 30,000 hectares of agricultural land, 11 settlements with around 6,300 households, approximately 30 economic objectives, and protection of additional objectives identified in regional development plans.

Furthermore, the project ensures water availability for additional uses, made possible by the usable storage volumes created in the reservoirs at NRL (Normal Retention Level), as a result of damming works at the designed impoundment steps. These flows will be used to irrigate up to 100,000 ha of agricultural land, supply drinking water to neighbouring localities, develop further economic objectives. These data are based on prior water balance studies, which indicated that after satisfying discharge requirements for navigation and hydropower generation, sufficient discharges remain to serve other uses within the areas covered by the designed works.

Additional developments works planned on the tributaries aimed at improving flow regimes and their connection to the canal. These works also provide additional defence of adjacent floodplains:

- On the Neajlov River, the construction of the non-permanent Comana Reservoir is planned for flood attenuation and flow regulation of Neajlov river downstream, up to the confluence with the designed canal on the Argeș river
- On the Sabar River, as well as on other tributaries, regulation and embankment works are planned to enable their connection with the navigable canal and to mitigate backwater effects from the impoundment steps near the confluence areas.

10.1.2. Risk of submersion

The flood protection works designed to safeguard settlements and land against inundation are diverse and include: frontal drainage along dams, counter-channel systems, drainage mattresses/arms at the outer base of dams, water evacuation systems for low-lying zones, as well as drainage systems designed to protect settlements against seepage.

Frontal drainage was designed for intercepting exfiltration (seepage) flows. It is planned for impounded sections where the normal retention level is located above the surrounding terrain, and where local lithological and hydrogeological conditions allow such seepage to occur.

The frontal drainage system captures exfiltration from the impounded river and has been designed as a closed collector system, with drainage pits and filter columns totalling 74,600 m.

The counter-channel ensures the evacuation of water collected from drainage mattresses/arms at the base of the dykes, as well as stormwater runoff from depression areas or from not surveyed valleys and slopes.

10.1.3. Seismic risk

From the seismic point of view, according to STAS 11100/1-93 "Seismic macrozonation of Romania", the hydrotechnical node HN1 of Oltenița, the hydrotechnical node HN2 of Budești and the hydrotechnical node HN3 of Gostinari are classified as macrozones of grade 71, and the hydrotechnical node HN4 of Varlam is classified as macrozone of grade 81.

According to the "Seismic Design Code for Buildings" indicative P100/2006, the hydrotechnical nodes HN1 of Oltenița, HN2 of Budești and HN3 of Gostinari are located in the seismic hazard zone

corresponding to a ground acceleration (ag) equal to 0.20 g, and the hydrotechnical node HN4 of Varlaam falls in the seismic hazard zone corresponding to a ground acceleration (ag) equal to 0.24 g (for earthquakes with mean recurrence interval (MRI) of 50 and 100 years). For hydrotechnical node HN1 of Oltenița the related Tc is 1.0 seconds, and for the hydrotechnical node HN2 of Budești, hydrotechnical node HN3 of Gostinari and hydrotechnical node HN4 of Varlaam Tc is 1.6 seconds.

10.1.4. Radioactivity

In Ilfov and Giurgiu counties, in the year 2008, there were no exceedances of the warning/alarm limits and no phenomena of radioactive contamination of the environment (the warning limit is 0.250 µg/h); the values are within the natural variation limits.

In Călărași County, at the level of 2007, following the global beta radioactivity measurements performed at the Călărași Radioactivity Station, for all environmental factors, no significant increases in radioactivity levels were found.

The values obtained were below the warning limit specific to each environmental factor.

10.2 Assessment of the risk of major accidents or damage during construction

The risks of accidents and damage during construction can be grouped as follows:

- *Risks due to climatic conditions*: rain, storms, fog, lightning, etc., which may prevent machinery and means of transport from working properly or construction technologies from being correctly observed;
- *Risks as a result of incomplete or inadequate design*, specifications, construction details, which may lead to degradation of various elements of the construction, or even collapse;
- *Technical risks* due to machinery and means of transport, through chronic breakdowns, totally accidental causes (explosions, breakages, etc.), lack of maintenance or preventive repair;
- *Human risks*, which are usually due to insufficient qualifications, consumption of alcoholic beverages, non-compliance with technology and working rules, physical dysfunctions during work (illness, dizziness), etc.
- *Risks due to wrong decisions* by site management
- *Combined risks* due to different, singularly minor, causes or faults, but which synergistically can cause accidents and major damage. They are usually quite numerous and sometimes totally unpredictable.

10.2.1. Potential accidents during the execution period

The most common accidents on a construction site are usually caused by non-compliance with safety rules:

- working with machinery and means of transport;
- internal road traffic and access roads;
- fires due to various causes;
- electrocutions, burns, blinding from welding machines
- inhalation of dust or gases
- explosions of oxygen cylinders or other containers due to the storage of flammable substances
- landslides or ditch collapses
- falls from heights or in excavations
- crushing by falling elements
- drowning due to the execution of works on the banks of watercourses.

These types of accidents, with the exception of slope landslides or the triggering of possible

landslides, have no impact on the environment, as they are limited in time and space, but they can cause loss of life or disability. They can also have negative economic effects through material losses and delays of works.

Another category of accidents during this period may occur in connection with the local population, which is not used to traffic concentrations induced on access roads or in the area, or through localities. They can also be affected by unfinished or ongoing works, unmarked or without warning signs, large excavations, scaffolding, fallen electrical wires, etc. The victims are usually curious and less well-informed children, attracted by the novelty of the site, and the worst times are the days when no work is being done and access control to work sites is less controlled.

As the construction site is not in residential areas, accidents involving the general public are minimised.

10.3 Assessment of the risk of major accidents or damage during operation. Potential accident during the operation period

These accidents may briefly include:

- accidents due to unfavourable weather conditions: fog, ice, snow, hydroplaning, thunderstorms with strong winds, hail.
- accidents due to navigation system malfunctions, which are quite common in our country.
- accidents due to faulty signalling works
- serious accidents due to technical faults in the means of transport: tyres exploding, brakes failing, breakage of various mechanical components (in the case of bridge traffic).
- accidents involving explosions or fires caused by ships carrying flammable products or toxic or dangerous substances.
- accidents caused strictly by drivers: alcohol and more recently even drugs, fatigue, heated arguments with passengers, or even heart attacks, strokes.
- accidents due to landslides, falling trees, failure of retaining walls and embankment defences, floods or strong earthquakes
- accidental spills of waterway-specific waste.

10.4 Accident prevention measures

10.4.1. Preventive measures during the execution phase

These measures must be taken by the general contractor and subcontractors in compliance with the Romanian legislation on occupational health and safety, firefighting, security and civil protection, waste treatment and others. The provisions of the engineering projects, specifications, laws and regulations on quality in construction will also be respected. Briefly, such measures will refer to:

- strict control of the labour force in terms of site discipline: regular training, wearing of protective equipment, checks on alcohol or even drug consumption, presence only at the workplace assigned.
- checking of machinery, means of transport, cranes, equipment, mechanisms and tools before they are brought into service to ascertain that they are intact and in good working order.
- checking, at the prescribed periods, electrical installations, compressed air, oxygen cylinders or other containers with explosive, flammable, toxic and dangerous materials.
- checking at the start of work, in particular at the weekly restart, of the supports and digs of excavations, scaffolding or other supports, in particular bridge supports
- checking signs prohibiting access to certain areas, danger signs
- the erection of fencing, signs and other warnings to demarcate work zones to control the access of

persons to the site

10.4.2. Measures to prevent accidents during operation

- carrying out the works in strict compliance with the documentation and specifications, ensuring the technical and geometrical elements of the canal
- the erection of guide parapets upstream and downstream of the bridgeheads, connected to them, to prevent them from being hit head-on in the event of skidding or slipping vehicles.
- the provision of all necessary navigational signals, in particular those relating to speed and rights of way, placed in such a way as to enable seafarers to perceive and operate them.

All the above works and actions are necessary and useful to the extent that they are continuously supervised and properly maintained.

These preventive measures avoid or at least substantially minimise the danger of road accidents which, although they do not usually affect the environment, cause significant damage and loss of human life with consequences also in the field of protection of human life and activity.

If measures are taken to improve or extend port facilities in order to increase vessel traffic or capacity, it is necessary to ensure the same level of safety for the passage of ships, while minimising the risk of collisions, fires, explosions or loss of life.

It should be established that ships sailing in the port area should be fitted with special equipment such as radars, positioning and collision avoidance systems (LORAN-C/DECC/GPS or ARPA).

The use of radars or beacons on shore is recommended. There is a need for an increase in the qualification of pilots and a sustained pace of their training.

11. Non-technical summary of the information provided

11.1 Description of proposed works

The **site of the works** is located on the Argeș river downstream of the Mihăilești - Cornetu lake and on the Dâmbovița river downstream of the bridge on the Bucharest ring road, in the counties of Ilfov, Giurgiu and Călărași.

The **navigable waterway** - has a length of 73 km on the Argeș river and takes up a difference in level of 53 m through 4 hydrotechnical nodes (HNs), and on the Dâmbovița river a length of 31 km with a difference in level of 14.60 m, taken up by 2 HNs. The cross-section is trapezoidal with a width at the base of 80.0 m on the Argeș river and 40.0 m on the Dâmbovița river and a minimum depth of 4.50 m. The embankments were made from material excavated to control and deepen the river and are provided with defence, protection and waterproofing works on the waterside.

At present, the land related to the objective is located mainly on the public domain of the State and partly on the private domain of the residents.

At present, the land related to the objective is located mainly on the public domain of the State and partly on the private domain of the residents.

The main objectives expected to be achieved by implementing the investment are the following:

✓ **navigation** - linking Bucharest with the Danube ensures direct access to the port of Constanța, to the main cities along the Danube, as well as to the European inland waterway network;

✓ **flood defence** - for 11 localities, 9,800 households, approx. 50.000 ha of land, 378 km of roads, 5 km of railway and 126 socio-economic objectives;

✓ **water supply and irrigation** - to neighbouring localities, irrigation of approx. 50 thousand ha., dewatering of approx. 30 thousand ha, production of electricity - 126 GWh/year, as well as fish farms on 1,250 ha;

✓ **social benefits** - by providing conditions in the area for: the development of related objectives and activities, the creation of logistic zones and industrial parks, the increase of the economic potential of the neighbouring localities, including job creation and the absorption of unemployment.

The present Feasibility Study is an update of the Study approved by the Technical and Economic Committee of the Ministry of Transport and Infrastructure by Approval No 71/80 of 19 July 2012 and by the Interministerial Council for the Approval of Public Works of National Interest by Approval No 42 of 17 August 2012.

The water link between Bucharest and the Danube has been of interest since the end of the 19th century. In 1929, the Romanian Parliament adopted the "Law for the Construction of the Argeș - Bucharest - Danube Canal". The economic recession of 1930-1933 and the pre-war situation made it impossible to start its construction.

After 1960, new studies were conducted on the water link from Bucharest to the Danube.

Since the floods between 1970 and 1980 caused major damage, in May 1982 the Ministry of Transport and Telecommunications was given the task of drawing up studies and documentation for the development of the river control works on Argeș river. In July 1984, Bucharest was linked to the Danube by the Argeș and Dâmbovița rivers.

In 1986 works began under the project "River control works on Argeș river for navigation, irrigation and other uses" and in 1988 on the Dâmbovița river.

In January 1990, when work on the Argeș and Dâmbovița rivers was at a very advanced stage, they were suspended and abandoned due to a lack of financial resources.

In September 2009, the Feasibility Study for the "River Control Works on Argeș and Dâmbovița Rivers for Navigation and Other Uses" was contracted. The vandalization of the concrete constructions and the degradations found in place made it necessary to prepare technical expert reports on them in order to enable the further preparation of the FS.

The Feasibility Study has been approved by the Technical and Economic Committee of the Ministry of Transport and Infrastructure by Approval No 71/80 of 19 July 2012 and by the Interministerial Council for the Approval of Public Works of National Interest by Approval No 42 of 17 August 2012.

When the works for the complex river control works on the Argeș and Dâmbovița rivers were halted in January 1990 and the site was left, the following main works had been performed:

✓ **The following volumes of control works had been performed on the Argeș river for navigation:**

- 73% of the total volume of 96.9 million m^3 of excavations;
- 69% of the total volume of dykes totalling 47.8 million $m^{3;}$
- 39% of the quantity of 2,125 thousand m^3 of concrete;
- 46% of the 1285 thousand m^2 of concrete cut-off walls;
- 36% of the area of defences and embankment protection totalling 4.6 million $m^{2;}$
- 24% of the total quantity of hydromechanical equipment of approx. 11.4 thousand tonnes.

Moreover, more than 80 per cent of the following works had been executed:

- infrastructure of the platforms of Oltenița and Bucharest ports;
- bridges over roads and the railway bridge at Grădiștea over the navigable Argeș river;
- crossings of power lines and pipelines over the improved river;

the most difficult works were also at an advanced stage of execution, such as:

- the foundations of hydrotechnical nodes (the floor beds of locks, wasteways and hydroelectric power plants);
- the outports related to hydrotechnical nodes.

✓ **The following control works had been performed on the Dâmboviţa river for navigation:**

- river bed development in the 3rd reach, between the port of Glina Harbour and the HN of Tânganu;
- works for the defence and protection of the slopes on the 3rd reach with reinforced concrete slabs;
- at the Port of Glina, the mooring quays and approx. 30% of the port platforms had been built;
- at the HN of Tânganu, the simple lock is limited to concreting the lock chamber up to the level and construction of the upstream head;
- partial roads for emergency interventions on the Glina - Tânganu reach.

Through this project, the following works have been proposed at this stage to continue the existing works:

- ✓ **Argeș river**
  - construction of the navigable fairway
  - construction of hydrotechnical nodes - 4 Hydro-technical Nodes: HN1 of Oltenița, HN2 of Budești, HN3 of Colibași (Gostinari), HN4 of Copăceni (Varlaam)
  - improvement of the longitudinal and transversal profile of the river
- ✓ **Dâmbovița river**
  - construction of the navigable fairway
  - construction of hydrotechnical nodes - 2 Hydro-technical Nodes: HN 1 of Cucuieti, HN2 of Tanganu
  - improvement of the longitudinal and transversal profile of the river
- ✓ The ports part of the river control works:
  - two ports related to the capital - one in the south-west of the municipality - on the Argeș river, called Bucharest - 1 Decembrie and another in the south-east, on the Dâmbovița river, called Bucharest - Glina;
  - the port of Oltenița, situated at the confluence of the Argeș and Danube rivers.

Also, for the proper functioning of the activity along the canal, the transit of freight and economic activities, the organisation of accesses to the objectives along the Argeș river will be considered, as follows:

➢ ***Roads for emergency interventions, operation and maintenance*** along the Argeș river will be built on both banks. They will have a 6.00 metre carriageway and an 8.00 metre platform.

On the roads along the dyke crests, development works may be envisaged in order to create infrastructure for cycle-tourist routes.

➢ ***The road access to the port of Oltenița*** is made by means of Gheorghe Coșbuc Street, located on the right side of the railway access to the current port of Oltenița. After crossing the city's old flood defence embankment (km 1+300), the access road to the new port at the confluence of the Argeș - Danube bifurcates, providing road connections to the river docks and platforms, as well as to those at the confluence of the Argeș - Danube rivers.

The road access, in the present documentation, has a carriageway with a width of 7.0 m and a platform of 9.0 m. The road structure consists of asphalt.

➢ ***The railway connection to the port of Oltenița*** - the Danube berths - branches off from the railway line serving the current Oltenița port and heads towards the berths made at the river, at the mouth of the Argeș river.

The access railway line to the new the port of Oltenița, built in 1987 - 1988, was decommissioned in the period that followed, and part of the land on which the railway embankment had been built was leased to economic operators.

The railway works for the connection to the new the port of Oltenița will consist of:

- rehabilitation of the existing industrial railway line on the site, connected from the Y head to the railway station of Oltenița, 1.5 km long;
- 1.7 km long railway connection from the existing industrial railway line (IRL) to the port platform;
- two railway lines in the port platform, with a minimum net length of 700 m.

➢ ***The road access to the hydrotechnical node HN 1 of Oltenița*** is provided on Dr. Lucian Popescu Street. After crossing the flood defence embankment (km 0+950), the access road to the hydrotechnical node is located on the route that was realised ever since 1986-1987. The access road to HN1, from the town's flood defence embankment face to HN1, has a carriageway width of 7.0m and a 9.0m platform. The road structure on this section is of crushed stone.

➢ ***The road access to the hydrotechnical node HN 2 of Budești*** is realised from the relocated county road DJ 301.

The access itself has a crushed stone road structure with a 7.0 m wide carriageway and a 9.0 m platform.

➢ ***The road access to the hydrotechnical node HN 3 of Gostinari*** is planned to be realised from the county road DJ 412. The road structure is made of crushed stone and the carriageway is 7.0 metres wide.

➢ ***The road access to the hydrotechnical node HN 4 of Copăceni (Varlam)*** is provided from the county road DJ 412, as well as from the communal road DC 100 with access to county road DJ 410 A, and from the national road DN 5 Bucharest - Giurgiu. The access uses existing roads up to the node area, from where it goes up to the platform of the hydrotechnical node.

➢ ***Road access to the port of 1 Decembrie*** is via a road built between 1986 and 1990. This road branches off from the national road DN 5 Bucharest - Giurgiu at the entrance to 1 Decembrie. It has a 7.0 m wide carriageway and a 9.0 m platform. The road structure is made of asphalt for most of its length. The asphalt structure will now be realised on the final section, including the platform for the operational constructions in the area.

➢ ***Rail link to the port of 1 Decembrie***

This 8.2 km long railway link was built between 1986 and 1990, starting from Jilava railway station.

For this rail link, an overpass was built over the DN5 national road, as well as a metal bridge (lattice girder with a low track) over the Sabar river with a span of 42.0 m.

In the immediate vicinity of the port platform, an approach yard with three railway tracks - each having a minimum net length of 750 m - was also constructed. From this approach yard, access to the railway lines on the port platform is provided.

Access to the objectives on the Dâmbovița river

➢ ***The roads intended for emergency interventions, operation and maintenance along the Dâmbovița river*** are roads for the access of machinery for interventions in case of need to work on the navigable canal.

These roads will be built either on the crest of the dams in the fill areas or on their banks in the cut areas of the navigable canal, on both banks.

➢ ***Road access to the hydrotechnical node of Cucuieți***

The access to this hydrotechnical node is made on a communal road that branches off from the county road DJ 301 in Cucuieți. The road is made of crushed stone with a carriageway width of 7 m and a platform width of 9.0 m.

➢ ***Road access to the hydrotechnical node of Tânganu***

Access is from the county road DJ 301 on a street in Tânganu. The road connects to the left bank in the area of the node. On the right bank, access to the node is made via the road alongside the development.

➢ ***Road access to port of Bucharest - Glina***

The access to the port of Bucharest - Glina will be made from the slip road connecting the ring road of

the capital to the A2 motorway.

The access road is 0.250 km long, the carriageway is 7.0 m wide and the platform is 9.0 m wide. The road structure will be asphalt surfaced.

- ***Railway link to the port of Bucharest - Glina***

The port of Glina will be linked to the railway network by a:

- railway link from head Y of the railway station Bucharest South, technical group, 2.1 km long, overcrossing the Bucharest ring road and the railway ring;
- 2 railway lines on the port platform, with a net length of 400 m.

The route of the link runs along the ring railway line, between the ring railway line and the ring road of the municipality, intersecting the Bucharest - Constanta motorway under the existing overpass.

The location of the port of 1 Decembrie was chosen in the area of a meander of the Argeș River, on the left bank of the river, between Dărăști and 1 Decembrie, avoiding the expropriation of arable land or forests. The Port of 1 Decembrie will ensure, mainly together with the Port of Glina, the flow of goods traffic necessary for the capital.

11.2 Expected environmental impact

11.2.1. Impact on water

The impact on water during construction can be summarised as follows:

- ***physical impact on surface water and groundwater***
  - altering the water regime by diverting watercourses
  - increased water turbulence in the area of bank protection works
  - increased water turbulence in the area of bank protection works
  - temporarily changing the river bed in the area of bridges
  - obstacles to the free flow of water as a result of works at the riverbed
- ***impact on groundwater and surface water quality***
  - consequences of accidental pollution by hydrocarbons or other toxic substances
  - consequences of discharges of untreated or insufficiently treated wastewater or contaminated stormwater

Modern construction techniques have been chosen to carry out the work, and the machinery used will be regularly checked and repaired. Construction materials and waste will be stored in specially designated areas proposed by the contractor carrying out the works (to be recommended for the site organisation).

11.2.2. Potential impact on air

Activities carried out on the work zones, site organisations, on access roads to the project site can contribute to air pollution. Concentrations of air pollutants vary from day to day and are influenced by the specifics of the works, meteorological conditions, average fuel consumption and the surface area of the site where the works are carried out.

Air pollutant emissions generally occur within a working zone and up to 10-15 m to the side of the farm road used for access to the site/working zone.

Sedimentable dust emissions are temporary, normally, at the end of each working day, the environment returns to its original state without affecting air quality.

The daily values will comply with the maximum permissible values imposed by Law No 104/2011 on ambient air quality.

The works for the development of the navigable canal, during their execution, will have significant, temporary and reversible impacts on air quality, but these will cease once the works are completed so there will be no indirect (secondary) effects on other environmental factors.

There will also be no significant impact on air quality during operation.

By carrying out ship traffic on the canal, noxious emissions will be reduced compared to traffic on public roads, so that no significant impact will be generated during the operation period.

In inland areas where there will be access roads to port areas, the level of air pollution will be however insignificant, since the roads will be laid with suitable materials so that the level of noxious emissions will be as low as possible when the tyres rub against the asphalt layer. In addition, given the future trend of shifting the car fleet from fossil-fuelled to electric/hybrid cars, the level of NOx from fuel combustion will be decreasing.

11.2.3. Impact on biodiversity

Activities during project implementation may have a direct negative impact on terrestrial vegetation and fauna **through the temporary occupation** of areas by site construction and borrow pits/quarries for local materials. This type of impact is difficult to quantify.

The deforestation foreseen by the project refers mainly to the removal of vegetation that has grown over the existing built structures during the abandonment of the construction site, as well as the area adjacent to the project, which is heavily anthropized, representing anthropogenic, non-productive and riparian biomass, characterised by predominantly invasive, ruderal, common shrub species and not including habitats of conservation importance, which are absent from the project area. The project area, for the most part, does not provide habitats required by fauna species of conservation importance, no specific breeding sites located within the perimeter of the deforestation were identified during field investigations, except for the **8 biodiversity zones,** important for ornithological fauna, with clusters of common and conservation important species. Some of these areas are also important for other wildlife classes (herpetofauna, mammals):

In particular, the area standing out here is that of the **Tătaru lake and forest** in **Plătărești**, where the project foresees a diversion of the route from the current course of the Dâmbovița river and cutting its meandering by crossing the lake and the forest. As the area is populated by faunal species of community importance, **a moderate to major impact** is expected through the loss of key habitats of the highlighted species, some of conservation importance, with a reduction in population numbers and habitat fragmentation.

We note the presence of an additional pressure and threat to the analysed area through the expansion of the Liziera de Lac residential complex, which represents a potential negative cumulative anthropogenic impact with the present project plan on the biodiversity of the lake and the forest.

As the area is degraded and heavily anthropized, no major biodiversity elements of conservation importance will be affected during the soil and subsoil works.

Overall, the project's impact on biodiversity will be felt in the short and medium term, both during the works in the project areas or in their immediate vicinity and during the first years of operation, until the appropriate conditions of vegetation adjacent to the banks and the restoration of the river ecosystem are restored. The impact will be **reversible** with a **positive** value in the next 2 years of operation, provided that the measures to prevent/reduce the impact are respected. The frequency of impact occurrence will be high during the construction period and low, diffuse during operation in the early years.

The negative impact on biodiversity of the hydrological works part of this project is considered to be **moderate**, temporary, manifested by the loss of breeding, feeding and resting habitats - as a result of temporary and permanent modification of the current characteristics of watercourses.

In total, a **significantly positive direct and indirect** overall impact on all ecosystems is expected during the operational period, primarily through improved water quality. This could lead to an increase in specific fish composition.

However, since a design solution for the migration of fish (and other aquatic faunal classes) from

upstream to downstream was not foreseen, a **moderate-major impact** was estimated for this aspect, with the recommendation to address the deficiency ever since the design stage.

11.2.4. Potential impact on soil

The impact on the soil only occurs within the working zone, during the execution period through storage areas, site organisation, temporary access roads. There will also be temporary and permanent land occupation for the implementation of the project.

Areas temporarily affected by the works were limited to the minimum necessary. These will be demarcated in the field and strictly respected during the works. It is strictly forbidden to move or park construction machinery off the existing service roads so as to avoid further compaction of the existing soils on the project site.

Equipment with appropriate characteristics will be used in the execution of the construction works, and they will be checked and repaired periodically, so that the danger of pollution with petroleum products is reduced/eliminated.

All construction materials and waste will be stored in specially designated areas within the site organisation so that there is no danger of soil contamination.

During the operation period there will be no impact on the soil, except in the areas of access roads in case of spills of petroleum products, accidents involving vehicles transporting hazardous products/chemicals.

11.2.5. Impact on human settlements and other objectives

For the implementation of the project that is the subject of this report, land areas will be occupied permanently both along the Argeș and Dâmbovița rivers. From the analyses carried out the categories of land occupied will be predominantly agricultural land.

The surface areas of these lands relative to the total surface area of agricultural land at the county level is insignificant, but at landowner level, the impact will be significant and long-lasting. Some of the land is already occupied by construction started but not completed in the previous phases of the project.

The implementation of the project as a whole will bring added value to the area through economic development, the development of commercial activities, the creation of new jobs, the development of access roads and also the securing of the land against flooding by developing the banks of the two watercourses.

11.3 Measures to reduce the impact

In order to prevent, minimise and compensate for adverse effects on environmental factors during construction and operation, a number of measures will be taken as described below.

11.3.1. Measures to reduce the impact on the environmental factor water

During the execution of construction works on the Argeș and Dâmbovița rivers for navigation and other uses:

- works in water bodies for the installation of hydrotechnical equipment and constructions as well as dredging and fairway development works will be carried out outside rainy periods, when there is an increase in turbidity of the water due to the entrainment of sedimentable particles by precipitation water;
- accidental spillages of hydrocarbons, grout or other substances used to execute the works will be prevented;

- it is strictly forbidden to discharge liquid waste (slurry from washing machines) on the construction site or near water bodies;
- it is strictly forbidden to spill water used for the washing of lorries;
- washing and repair of machinery will be carried out only in authorised centres, away from the bed of the water body and outside protected natural areas
- hydraulic equipment to be operated on the site, particularly in the vicinity of the water body, will use non-toxic and biodegradable hydraulic fluids;
- throughout the construction works and upon their completion, the bed of the body of water will be cleared of any material which would impede the normal flow of water;
- upon completion of the works, the contractor will clear the site of temporary works;
- bulk building materials (especially dust-generating materials) should be stored indoors or covered until used to avoid being blown away by wind or rain;
- the waste will be collected and stored in specially designated areas within the site organisation and will be disposed of by a specialised company. It is strictly forbidden to dump waste in undeveloped areas close to the bed of the water body;
- all machines operating on the work zones and motor vehicles used for transporting construction materials will be checked regularly to avoid oil or fuel spills or emissions of air pollutants.

During the operational period there will be no sources of pollution of the water body except in the event of accidents involving vessels transporting dangerous products or with malfunctioning and leaks of oil products.

11.3.2. Measures to reduce the impact on the environmental factor air

During the execution of construction works on the Argeș and Dâmbovița rivers for navigation and other uses:

- aggregates will be transported only by means of sealed containers to prevent the emission of powdery materials and using the shortest route so as to minimise exhaust emissions;
- aggregate stockpiles will be covered to prevent wind or rain from blowing sedimentable dust;
- machinery and lorries used for the transport of construction materials will be periodically checked and will be used only if they meet legal standards;
- the working zone will be sprayed periodically to limit the emission of sedimentable dust;
- it is recommended to use machinery with diesel engines as carbon monoxide emissions are much lower than in the case of petrol engines
- technological processes that produce a lot of suspended dust/powder (demolition, topsoil removal/covering, excavation/filling) will be limited during periods of high winds or the surfaces being worked on will be more heavily wetted;
- the machines will be equipped with silencers, sound absorbers, noise traps, loudspeakers and fan silencers in order to comply with legal limits.

During the operation period the main source of air pollution is the road traffic in the areas neighbouring the ports or the canal, represented by mobile sources of pollution, and the level of pollution will be higher than the current level.

During this period it is not necessary to use facilities for the collection/dispersion of emissions of air pollutants or to adopt specific air quality protection measures.

11.3.3. Measures to reduce the impact on the environmental factor soil

During the execution of the construction works:

- the areas proposed in the project to be temporarily affected by the works will be limited to the minimum necessary, will be marked in the field and will be strictly monitored for compliance
- modern equipment and construction technologies will be used to minimise pollutant emissions;
- construction machinery and lorries used for the transport of construction materials and waste will only travel on the existing road area. It is strictly forbidden to move these machines outside the existing work zone and the existing road reservation area;
- construction materials and waste will be stored in special areas within the site organisation. It is strictly forbidden to store them directly on the ground or in the vicinity of the bed of a water body;
- it is strictly forbidden to refuel machines on a work zone;
- construction materials and waste will be transported in lorries equipped with means of protection against their spreading on the traffic routes, in compliance with the legal regulations in force;
- checking and repair of machinery should only be carried out in specialised centres, far away from the bed of a water body and outside the protected area
- it is strictly forbidden to carry out on-site repairs to machinery or means of transport in order to avoid spills of fuel and lubricants on the ground;
- at the entry/exit points of the site, vehicle wheel cleaning areas will be installed in order to reduce the amount of sediment transported and to avoid damaging the areas in the neighbourhood of the project site, to avoid soiling of public roads;
- in the event of accidental pollution, the services of a firm specialising in depollution will be used to limit the area affected and remedy the pollution.

During the operational period, the impact is insignificant, so no special mitigation measures are required.

11.3.4. Measures to reduce the impact on biodiversity

In order to prevent/reduce the impact on biodiversity, 13 specific measures have been proposed to protect and restore biotopes with species of conservation importance, avoid the spread and eradication of invasive species, provide resting and breeding habitats for common fauna species, and preserve specific biodiversity areas. Measures were recommended to maintain the longitudinal and lateral continuity of both river courses.

Moreover, a programme for the execution of the works was recommended, with periods in which the works in the breeding areas of wildlife populations are avoided. A monitoring plan was recommended to ensure compliance.

11.3.5. Measures to reduce the impact on the social factor (human settlements, population health)

The objectives on reducing the exposure of the population to noise and pollutants are met through the measures considered for the environmental factors noise, water and air. Another way of minimising the impact on the population and public health is to locate the project in an area more than 0.500 km away from the residential area. Thus, for the study area, the nearest residential area is located more than 0.500 km from the project site, which is sufficient distance for the population not to feel the effects of noise and vibration produced during the construction phase.

In order to prevent and ameliorate the pollution of human settlements in the area adjacent to the project, access roads to/from the analysed perimeter, during the transport of materials, for the entire duration of the execution of the planned construction works, it is necessary to cover the tippers with tarpaulins during the transport of dust-generating materials and/or their wetting; to spray the materials in the storage area and the roadway (car parks for access to the work perimeters and the outer areas); to restrict the speed of tippers to 25 - 30 km/h. All machinery and equipment used in construction works must comply with the requirements of Directive 2000/14/EC on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors.

It is also necessary to ensure traffic management during the works, with a focus on the urban areas.

During the execution of the works, rest hours must be observed at night between 10 pm and 7 am.

In order to prevent the spreading of dust and, consequently, of suspended particles both on the access roads from the site organisations and from the work zones, it is necessary to carry out daily cleaning of these access roads and maintain them.

Work areas (work zones, material storage areas, etc.) must be properly fenced off, lit at night to avoid accidents, and access must also be restricted.

Site organisations must also be delimited, adequately lit, properly signposted and the access of outsiders/unauthorised persons must be restricted to avoid accidents.

Work zones will be provided with mobile sanitary installations, with chemical neutralization or septic tanks periodically vacuumed by an authorised operator.

Where the situation makes it necessary and there are complaints from the population in the riverside areas about increased noise levels during the works, mobile sound-absorbing panels will be used.

A form of positive impact on the population during both the works execution and operation periods is the increase in the number of jobs, which will also lead to an increase in the economy, and to maintain this form of positive impact the employment of staff from the riverside areas must be encouraged.

11.4 Conclusion

Through the measures proposed by the contractor, the impact produced during the implementation of the project will be considerably reduced. These measures relate in particular to the treatment of waste water resulting from the site organisation, equipping asphalt mixing plants with filters to retain dust, machine maintenance, waste management, etc., compliance with deadlines and technologies in the case of controlled explosions.

As a consequence, the impact during the project implementation period will be on the short term and will manifest on the terrestrial ecosystem (directly) and the aquatic ecosystem (indirectly).

The materials used for the works are neither polluting for the environment nor favourable for the development of undesirable species in the canal waters.

Upon completion of the works, the contractor will restore the land occupied by the site organisation to its original state. If accidental pollution has occurred, the contractor will take depollution measures.

Due to the nature of the works, there will be no significant negative impact on the environment during the operation period.

The proposed measures to reduce impact for both the design and execution phases, as well as for the project implementation period, are summarised in an environmental management plan.

A monitoring plan was developed to monitor the quality of environmental factors, both during and after project implementation.

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