European Commission

Policy Summary of Guidance Document nº34

Application of water balances for supporting the implementation of the WFD

May 2015

The Water Framework Directive (WFD)[1] aims for long-term sustainable water management based on a high level of protection of the aquatic environment. One of the main objectives of the WFD is to achieve 'good status' for all ground and surface waters by 2015. However, the 2012 Commission 'Blueprint to safeguard Europe's Water Resources'[2] found that about half of EU surface waters are unlikely to reach good ecological status in 2015, and identified important gaps in monitoring, water quantity and efficiency issues. This communication proposed a wide range of implementation tools, including water accounting, which have been taken up in the 2013-15 work programme for the WFD's common implementation strategy[3].

Water management in the EU is affected by several problems, including the consequences of water scarcity, droughts and land degradation caused by the over-exploitation of water resources, which are exacerbated by climate change. The implications thereof are plenty, including changes in river flows and seasonality, land-use changes and extensive water withdrawals. In all probability, these problems will increase further, although some European countries will be much more affected than others.

Bringing in water accounting and efficiency objectives at sectorial level could provide a stronger basis for effective and targeted water protection measures and guide water policy and management at the different levels of decision-making. Water accounts can tell how much water flows in and out of a river basin and how much water can realistically be expected to be available before allocation takes place.

To establish some common ground, the Guidance Document **on the application of water balances for supporting River Basin Management planning processes and the implementation of the Water Framework Directive (WFD) in Europe** has been developed. It focuses on the development of water asset accounts (water balances in the form of standard tables with compiled data sets) with the aim of providing useful information on their development and use, and promoting to a certain extent comparability.

The aim of the document is to promote a coherent framework to cross-evaluate the information on drivers, pressures and impacts on water quantity (including in terms of the coherence between water abstraction and water recharge, water flows between water bodies/catchments, storage changes over time, etc.).

To develop the guidance document previous works were assessed and considered, and an important part of the proposed methodology was based on the UN System of Environmental Economic Accounting for Water (SEEAW) and its 'Asset Accounts'. As reflected in the document, the **bases for water balances are** the components of, and equations that govern, the hydrological cycle. These balances measure stocks at the beginning and the end of the accounting period and record the changes in those stocks. They account, for instance, for: rainfalls that reach the soil surface and the vegetation where water can be intercepted; water infiltration in the soil or run off; the contribution of groundwater to river flows;

[1] 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, OJ L 327, 22.12.2000.

[2] COM(2012) 673 final.

[3] The common implementation strategy (CIS) is a cooperative and open process involving the Commission, Member States and stakeholders. It started in 2001 and aims to facilitate WFD implementation.

evapotranspiration, or direct evaporation from the soil or from the river. The hydrological cycle parameters are complemented with anthropogenic water abstractions and returns to the aquatic environment.

Water balances can be further **expanded and complemented** with additional parameters relevant to water accounting, management and policy. These include water use per economic sector, alternative water supplies (desalination, water reuse), water demands, conveyance efficiency and losses, or economic information on the main water users (e.g. yields, income generated, etc.). The relevance of including or excluding specific water components will depend on the water management issues that need to be addressed, the importance of quantitative aspects, and the specificities of the river basin being assessed.

The **time scale** should be carefully selected based on management issues, catchment considerations, management decisions, and potential solutions. Moreover, water managers will need to assess obtained results from water accounts always considering the time scale adopted, and adjust measures accordingly and tailored to the selected period.

A wide range of **spatial scales** are relevant to the different hydrological processes accounted for in the water balance. The key processes that are addressed as priorities in water management decisions should help in reflecting on the choice of the most appropriate spatial scale for establishing a water balance. Building water balances for very large catchment areas can mask the variability of water resources and water demands within the study area. On the other hand, developing water balances for very small water units will not help identify water management challenges that could be addressed by changes in water management rules applied at the water catchment, river basin or sometimes regional/national scales.

Uncertainty in estimates of the main water balance output indicators is inherent to the water balance development and calculations. Uncertainty depends on the accuracy of data and measurements used to estimate key parameters, or on the application of specific estimation techniques, and model simulation, that also has uncertainty in estimated values. As eliminating uncertainty is impossible, understanding it is central to the correct interpretation of water balance calculations. The reliability of water balance estimates will be contingent upon the amount of data and hydrological/hydrogeological knowledge available, the availability of hydrological models, knowledge about initial and boundary conditions, maturity of process description, temporal and spatial discretisation.

While these might be challenging to estimate, the **environmental demand** (i.e. the quantities of water to be allocated to aquatic ecosystems so they properly function) **and other water requirements** that have a legal basis (e.g. specific water discharges defined at a frontier point as part of transnational water treaties) should be considered when developing water balances, especially if these are expanded with economic uses and activities.

Water balances are **not yet systematically developed** and applied today in European catchments facing quantitative imbalances. Still, many water authorities in different MS have experience with the application of (full or partial) water balances or with assessment frameworks that have similarities with water balances, and the guidance document provides useful examples.

To support a wider range of water management decisions, physical water balance can be expanded, in particular to account for: **water quality** issues so it can help addressing water quantity and water quality issues simultaneously; the **socio-economic importance of water**

use (e.g. providing economic information such as gross income, value added or employment collected on the main water abstractors) so an overall picture of the role of water in the economic development of the water catchment/river basin is obtained.

Key lessons and recommendations highlight how water balances can help support the implementation of the WFD and the achievement of its environmental objectives in a cost-effective manner.

- Water balances can strengthen the **assessment of the potential risk of quantitative imbalance**, be it today or in the future if no preventive action is taken. They can be developed and applied when carrying out the WFD Article 5 analysis, helping to identify: (1) water bodies and/or catchments that are at quantitative risk and for which measures should be proposed for closing the water status gap; (2) significant pressures that explain current water imbalances; and (3) possible gaps in, and incoherence between, the existing knowledge on the different components of the hydrological cycle and on the inventory of water abstractions. Water balances should consider the **environmental demand** of aquatic ecosystems in coherence with the definition of e-flows for surface waters.

- Water balances can also be used to **select measures for the WFD Programme of Measures**. They can help: assess the effectiveness of measures proposed for improving the quantitative balance of surface and groundwater resources; review existing water abstraction permits; assess the relevance of water efficiency measures and of the development of water reuse. When complemented by information on the costs of measures, they can help prioritise potential measures based on their cost-effectiveness ratio so the combination of measures that can achieve a sustainable use of water resources at the lowest possible cost is identified. In some cases, the technical, environmental and economic information provided when linking water balances to socio-economic information can help in investigating the need for any WFD exemptions. Finally, water balances are critical to enable the comparison of the different management options, including the development of new infrastructure (e.g. dams), that require compliance with Article 4(7) of the WFD.

- Accounting for future **climate change** scenarios and their impacts on rainfall, water balances can also support the climate-proofing of measures, and the selection of measures that enhance the resilience of aquatic ecosystems. Water balances can also be used as the basis for emergency plans in the case of water shortages and of conflicting water uses.