"Ecological Flows: foundations, methods and European legislation"

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The flow regime shapes freshwater ecosystems

All rivers, lakes, wetlands and groundwater dependent ecosystems are largely controlled by the hydrological regime.

Flow variability: Suggestions for ecosystem dynamics
Patterns: Suggestions for hydrological and biological cycles
Thresolds

Caudal (m$^3$/s)
Flow events

Caudal (m$^3$/s)
Native biota can be severely affected by flow modification. 

Native biota is affected by significant changes in the flow regime.
Hydromorphological pressures affecting ecosystems

There is a need in many EU river basins to put quantitative water management on a much more solid foundation: namely the identification of the ecological flow.

There is no EU definition of ecological flow, nor a common understanding of how it should be calculated, even though these are preconditions for its consistent application.

The second most common pressure on EU ecological status stems from over-abstraction of water.

The status of EU waters is not doing well enough!

THE BLUEPRINT: The Blueprint to safeguard Europe’s water resources sets out to strengthen and fill the gaps in EU water policy.
Aims

This document aims to be guidance to stimulate a common uptake of ecological flows in order to support the achievement of the Water Framework Directive’s environmental objectives.

Covering the whole WFD implementation process, it develops the steps where consideration for ecological flows is critically needed.

Working definition

Ecological flows are considered within the context of the WFD as “an hydrological regime consistent with the achievement of the environmental objectives of the WFD in natural surface water bodies as mentioned in Article 4(1)”.

Considering Article 4(1) WFD, the environmental objectives refer to:

- non deterioration of the existing status
- achievement of good ecological status in a natural surface water body,
- compliance with standards and objectives for protected areas
It has been estimated that some 200 different generic methods have been developed to derive ‘ecological flows’ for different purposes depending on the specifics of the case study and the type of issue to be addressed (water planning, monitoring, river restoration plan, etc.).

Source: International Water Management Institute web page
Existing methods differ in input information requirements, types of ecosystems they are designed for, time which is needed for their application, and the level of confidence in the final estimates.
Comparison of methods

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<th>Habitat modelling</th>
<th>Holistic</th>
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No single environmental flow assessment technique suits all social, economic, hydrological, and ecological contexts within a country.
Extending the concept to all the categories of water bodies

- Lakes
- Transitional waters
- Groundwater dependent ecosystems
- Wetlands
Extending the concept to the WFD objectives

Ecological flows should be different according to the particular environmental objectives of the water body (GES, GEP, PA)
Extending the concept to Protected Areas: Natura 2000 sites

Ecological flows shall be adequate to satisfy the ecological requirements of species subjected to a “system of strict protection” (Annex IV of the HD).
There is strong scientific basis for understanding the functioning of natural systems and the critical role of the hydrological regime. Environmental flows should incorporate different flow types and variability (low flows, high flow pulses, etc.) to allow proper functioning of ecosystems.

Although there are over 200 methods for estimating environmental flows not all of them are based on current scientific knowledge or practice. Only a small number of promising methods should be applied in the context of the EU.

The implementation of adequate environmental flows will improve many aspects of the water planning process envisaged in the WFD, helping to achieve the environmental objectives of this and other directives.
Thank you!

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