Ecological flows in the context of the EU Water framework directive implementation

Minna Torsner / IEA Seminar / 10th of June 2014



Background

- Water framework directive (WFD) obligates member states to define environmental objectives for waters
- The environmental objectives: Good ecological status or good ecological potential (for heavily modified waters) and good chemical status
- Ecological status defined with biology; hydrology needs to be such that good biology can be achieved
- Measures needed to reach the objectives

 Emphasized importance of hydrology to ecology lately





Patterns: Suggestions for hydrological and

biological cycles



Extreme conditions: Suggestions for disturbance theory, resilience and so on.





EU guidance under way: Identification of ecological flows in the implementation of the Water Framework Directive

 Starting point: the Blueprint to Safeguard Europe's Water Resources (Communication of the Commission), background of water scarcity and over-allocation:

"To address the issue of over-allocation, 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, i.e. **the amount of water required for the aquatic ecosystem to continue to thrive and provide the services we rely upon**.... Commission proposes developing a **guidance document by 2014...** Once a common definition and a methodology for the calculation are agreed, they should be **implemented in the next cycle of RBMPs due for adoption by the end of 2015.**"

- A non-binding guidance for EU member states
- Representatives of member states and stakeholders in the working group, led by the Commission, Spain and France







What is ecological flow?

- Definition in the guidance:
- Ecological flows are defined as "a flow regime consistent with the achievement of the environmental objectives of the WFD".
 - The objectives: Good ecological status or potential defined with biological quality elements
 - No additional and stand-alone requirement in addition to the goals of the WFD
 - Natural and heavily modified waters, rivers and lakes
 - Quantity and timing of flow; minimum flow, flow variation, flow change rate
- A challenge in the guidance work: many interpretation and vagueness of the eflow concept



Guidelines or regulations for the definition of eflows in EU

	Country	RBMPA (guidelines / regulations)	WFD& Hydropower questionnaire		
			Regulations	Standards	
AT	Austria	Yes	National legislation	Legal national standard	
BE	Belgium	No info	Set in individual cases	Set on case-by-case basis	
BG	Bulgaria	Yes / No / No info	National legislation	Legal national standard	
СҮ	Cyprus	Not assessed	No information	No information	
CZ	Czech Republic	No info	National legislation	National recommendation	
DE	Germany	Yes / No / No info	National & regional legislation	National & regional recommendation	
DK	Denmark	Not assessed	No information	No information	
EE	Estonia	No info	No information	No information	
ES	Spain	Yes	National legislation	Legal national standard	
FI	Finland	No / No info	Set in individual cases	Set on case-by-case basis	
FR	France	Yes / No info	National legislation	Set on case-by-case basis	
GR	Greece	Not assessed	No information	No information	
HU	Hungary	Yes	National legislation	No answer	
IE	Ireland	No info	No information	No information	
IT	Italy	Yes	National & regional legislation	Regional recommendation	
LT	Lithuania	Yes	National legislation	Legal national standard	
LU	Luxembourg	Not assessed	Set in individual cases	National recommendation	
LV	Latvia	Yes	National legislation	Set on case-by-case basis	
MT	Malta	No	No information	No information	Source:
NL	The Netherlands	No info	National legislation	No relevant method	Guido Schmidt
PL	Poland	No info	No answer	No answer	Guido Schimidi
РТ	Portugal	Not assessed	National recommendation	Legal national standard	
RO	Romania	No	National legislation	Legal national standard	
SE	Sweden	Yes / No / No info	Set in individual cases	Set on case-by-case basis	Intecsa-Inarsa
SI	Slovenia	Yes	National legislation	Legal national standard	
SK	Slovakia	No info	National recommendation	No answer	
UK	United Kingdom	Yes	National & regional recommendation	National & regional recommendation	

Preliminary contents of the guidance

- I. Policy summary
- II. Eflow concepts: importance of environmental flow
- III. Recommendations of ecological flow consideration and implementation in the WFD process
- IV. Case studies of ecological flows in EU member states





To the guidance: Description of different eflow methods

No single technique suits all social, economic, hydrological and ecological contexts within a country.



Hydrologic methods

- % annual flow: 5%, 10%, 30-50%
- Classified flows (percentiles): Q347, 7Q2...
- Hydro-biological methods (QBM, ...)

Hydraulic methods

- Depth, water velocity, hydraulic data...
- HEC-RAS, MIKE 11, etc.
- Eco-hydraulic methods

Habitat simulation

- IFIM (PHABSIM, RHYHABSIM, River 2D)
- EVHA

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Holistic methods

- Building Block Methodology (BBM)
- Expert Panel Assessment Method
- Scientific Panel Assessment Method

E-Flow assessment methods



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Experiences of the guidance work so far

- Positive to gather experiences from EU states
- Work on a very theoretical level
- Challenging to find recommendations for all circumstances
 - No standard solutions available to improve environment in constructed rivers
 - Very variable circumstances, e.g.:
 - In southern Europa: a river with water scarcity and many water users (municipalities, irrigation, hydro production)
 - In Northern Europe: a river with hydro production, water regulation important for energy production and grid stability





Spain: Eflows seen as a constraint for uses in water scarce conditions





Mediterranean climate area

- Mediterranean rivers have high flow regime variation (combining dry and wet seasons, with sudden floods)
- Flow regime is scarce most of the time
- This singularity must be taken into account in order to establish suitable Programs of Measures
- Environmental flows play an important role in order to achieve good status



Cost-effectiveness of measures

- Example: River Mörrumsån, the most important salmon river in Southern Sweden
- Different ecological flows tested in the old river bed of Granö hpp
 - Optimum for salmonids is between 50 70 % of average annual low flow
 - However, already at a third of these levels >80% of the potential can be achieved
- Habitat modelling useful in optimizing the flow

• Source: E.On, Johan Tielman







Costs of ecological flow?



- Example: Large hydro in Sweden (study by Vattenfall)
 - Eflow to dry channels: Loss of 10-13 TWh/year (15-20 % of yearly hydro production)
 - Reduced short-term regulation decreases the flexibility of the hydro power and thereby ability to integrate variable renewable production
 - Changes in seasonal regulation e.g. creating more natural flow regimes in Swedish rivers would give large negative effects on the electricity system. Excess electricity in summer, deficit in winter.

- Source: Vattenfall, Erik Sparrevik



Important to seek for win-win possibilities Example: Edeforsen, River Ljusnan, Sweden (1)



- Now: A regulated river with too high flow velocities in the rapid section in winter
- After: A more natural flow regime (100 m³/s during summer, 20 m³/s during winter)
 - Improved habitats
- Increased production by replacing of an old power station with a new (from 3 to 23 GWh)



Example: Edeforsen, River Ljusnan, Sweden (2)

- Habitat restorations and improved flow regime; habitat modelling shows the increased habitat area (below)
- Win-win possibilities exist and more water is not always better





Viewpoints of hydro power producers

Possible implications for hydro

- Loss of production and flexibility
- Important to seek for win-win possibilities

- Important to consider eflows case-by-case: no standard requirements
- **Cost-effectiveness** crucial, no significant impacts on energy production
 - According to the WFD also cost-effectiveness and impacts on important uses such as hydro power production must be taken into account
- Significant ecological improvement required for implementing of eflows
- Ecological flow just one possible mitigation measure, improving of morphology by e.g. habitat restorations just as important and often more effective



More information

• All material of CIS Ecological Flow Guidance:

https://circabc.europa.eu/w/browse/764dcfed-6e09-4683-be61-951647df760a

• Eflow on 26th of June in the Ecohydraulics Symposium



http://www.ntnu.edu/ecohydraulics2014

