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**.

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Flow variability: Suggestions for ecosystem dynamics

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 flows in EU

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<th>Country</th>
<th>RBMPA (guidelines / regulations)</th>
<th>WFD &amp; Hydropower questionnaire</th>
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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

Holistic methods
- Building Block Methodology (BBM)
- Expert Panel Assessment Method
- Scientific Panel Assessment Method
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 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 m$^3$/s during summer, 20 m$^3$/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/ecoeydraulics2014