Collection of Mitigation Measures for webpage and Wiki

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Background

Work Package 4 in FIThydro will collect and present measures to mitigate impacts from hydropower on fish. We plan to develop a public webpage or Wiki to enable users to find information and guidance for selecting the best mitigation measures. The first step towards this was the deliverable 4.1, a report that guides the hydropower operators and the environmental managers to select the right mitigating measure. The report classifies the measures according to the problem at hand, describes how they work, what fish communities they are targeted at and how certain it is that they work as intended. The content of the report will be used as base for the webpage/Wiki. We would like to extend the information and include more mitigation measures in the webpage/Wiki, and we need the contribution from all partners in FIThydro.

The measures are written using the **SMTD** (Solutions, Methods, Tools and Devices) concept which is frequently applied in formal documents in FIThydro. Our understanding of these terms is:

- Solutions – these are the overall concept for how to solve or mitigate a problem
- Methods – these are typically descriptions in how to develop and implement mitigating measures (solutions)
- Tools - these are methods embedded in for instance a computer program / a model
- Devices – these are typically physical instruments or equipment used to measure and/or control, something related to the measure

The solution is the measure itself, which will have different MTDs for different stages of the implementing measures:

- Planning
- Construction and implementation
- Operation and maintenance

Mitigation measures are classified according to the following main types of measures:

- Environmental flows
- Habitat
- Sediment management
- Downstream fish migration
- Upstream fish migration
- Turbine mortality

Additionally, we have developed a classification table to be used for each measure. This table describes relevant factors for the measure in a standardized way. Table 1 shows Criteria used for classification of each individual measure, and the available selections of each classification criteria.

Table 1. Criteria used for classification of each individual measure, and the available selections of each classification criteria.

Classification	Selection (multiple)	
Fish species for the measure	Single or groups of fish species in Europe	
Does the measure require loss of power production?	Operational (requires flow release outside turbine) Operational (requires flow release through turbine) Structural (requires no additional flow release)	
Recurrence of maintenance	Never Regularity (give recurrence interval – daily, weekly, yearly, less often than yearly, irregular at events)	
Which life-stage of fish is measure aimed at?	Spawning / Recruitment Juvenile habitat (0+) Juvenile habitat (1+) Juvenile habitat (older than 1+) Adult fish Movements of migration of fish	
Which physical parameter is mitigated?	Flow quantity Flow variations Substrate and hyporheic zone Water temperature Ice Water velocity Water depth	
Hydropower type the measure is suitable for	Plant in dam Plant with bypass section	
Dam height [m] the measure is suitable for	Categories in [m]	
Section in the regulated system measure is designed for	Upstream of hydropower plant Bypass section Downstream outlet	
River type implemented	Steep gradient (> 0.4 %) Fairly steep with rocks, boulders (< 0.4; > 0.05 %) Slow flowing, lowland, sandy (< 0.05 %)	
Level of certainty in effect	Very certain Moderately certain Uncertain Very uncertain	
Technology readiness level	TRL 1 TRL 2 TRL 3 TRL 4 TRL 5 TRL 6 TRL 7 TRL 8 TRL 9	basic principles observed technology concept formulated experimental proof of concept technology validated in lab technology validated in relevant environment) technology demonstrated in relevant environment) system prototype demonstration in operational environment system complete and qualified actual system proven in operational environment

Contribution from partners

We invite all partners in FIThydro to contribute by describing mitigation measures that are not yet included in the deliverable 4.1. All mitigation measures should be described in a structured way, similar to the deliverable 4.1. For each measure, the following text should be provided:

General type of mitigation measure:
Identify which type of measures the current measure is aiming at. Choose between Environmental flows, Habitat, Sediment management, Downstream fish migration, Upstream fish migration and Turbine mortality.

Introduction and overview:
Describe problem: What is happening to cause the problem (i.e. hydropeaking, reduced flows, disrupted sediment balance)? Why is it being done? What is the problem from an ecosystem perspective (i.e. fish stranding, reduced shelter due to clogging)?
Introduce solution: Describe the recommended solution to this specific problem, and how/why it works. Mention previous research and attempts at using the solution if possible. Comment on restrictions, pitfalls, and general recommendations.

Methods, tools, and devices to use during planning:
Describe how to perform the planning phase of the measure, as well as which tools and devices will or could be required and how these would be used.

Methods, tools, and devices to use during construction and implementation:
Describe how to perform the implementation phase of the measure, as well as which tools and devices will or could be required and how these would be used.

Methods, tools, and devices to use during maintenance and monitoring:
Describe how to perform the monitoring phase of the measure, as well as which tools and devices will or could be required and how these would be used.

Classification table:
Make sure to fill the classification table according to the available values given in the table at the beginning of this document. This is important for consistency between the measures, as well as for searchability on a future website. Sometimes a measure will not fit perfectly into a category, but we will just have to choose the best of the alternatives. Comments and limitations can be made in the introduction to the measure (or maybe include a comment box in the table?).

Note: From a website perspective, more images are better (as long as they are relevant). They help a lot with understanding, and make the page look better overall. Length is not really an issue here, since people will not be reading one single document containing all the measures.

A simple template for describing mitigation measures is available