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water bodies (TRANSWAT) LLI-533**

**RECOMMENDATIONS
FOR AMENDMENTS TO WATER
LEGISLATION**





TABLE OF CONTENTS

I. INTRODUCTION	4
II. EU REQUIREMENTS REGARDING E-FLOW IN HPP CASCADES	5
III. REVIEW OF NATIONAL LEGISLATIONS REGARDING E-FLOW IN HPP CASCADES	6
3.1. LITHUANIA	6
3.2. LATVIA	7
IV. RECOMMENDATIONS FOR AMENDMENTS TO NATIONAL WATER LEGISLATIONS	10
4.1. LITHUANIA	10
4.2. LATVIA	11
V. REFERENCES	13

Abbreviations

ECOSTAT	WFD CIS working group on Ecological Status
E-flow	Ecological flow
EU	European Union
HMWB	Heavily modified water body
HPP	Hydropower plant
HTS	Hydrotechnical structure
WFD	Water Framework Directive
WFD CIS	Water Framework Directive Common Implementation Strategy

I. INTRODUCTION

Recommendations for amendments to Latvian and Lithuanian legislation regarding E-flow in HPP cascades are prepared within the framework of the TRANSWAT project (2020-2022).

National legislation review that has been produced earlier in the course of the TRANSWAT project, in 2021, included analysis of EU-wide and national policy acts regarding Ecological flow in cascades of small hydropower plants. The results of this investigation are presented in the Deliverable report “Review of national legislations in the field of water uses”.

Results of river habitat measurements and modelling that have been carried out in 3 rivers in Venta river basin district downstream of 10 HPPs allow to propose several amendments to national legislation regarding E-flow in small HPP cascades.

This Project deliverable document can be seen as a “successor” of the ECOFLOW project (2017-2019) [1] deliverable documents T1.2.1 and T3.2.

II. EU REQUIREMENTS REGARDING E-FLOW IN HPP CASCADES

According to the provisions of the WFD [2], as well as the WFD CIS Guidance Document No.4 [3], water bodies severely affected by human activities should be distinguished as heavily modified ones, with an overall objective to achieve “good ecological potential” instead of “good ecological status”. Physical alterations due to small-scale hydropower normally do not fulfill the requirements for the designation of HMWBs [4]. Nevertheless, it is recognized that river ecosystems deteriorate the most when *cascades of reservoirs* are introduced [4; 5].

Ecological flow (or, more precisely, ecological flow regime) is one of the key aspects for achieving good ecological status in rivers. As for HMWBs, flow regime to be implemented in these water bodies should be the closest possible to ecological flow. There are no specific requirements in the WFD or other EU legislative acts investigated, with regard to the provision of E-flows in HPP cascades.

III. REVIEW OF NATIONAL LEGISLATIONS REGARDING E-FLOW IN HPP CASCADES

3.1. LITHUANIA

Some of the screened legislative documents mention HPP reservoir cascades and requirements for their operation and flow regime regulation in the impounded rivers. However, the definition of such a layout of hydrotechnical structures is not proposed.

Technical Regulation for Construction STR 2.02.06:2004 [6] “**Hydrotechnical structures. Basic provisions**” requires that the design, construction and operation of HTS must provide for and guarantee the most appropriate regime for river flows, water levels and flow velocities in the lower reaches, taking into account the interests of all water users and consumers. The release of the water flow must not interfere with the use of the hydrotechnical structures below or impair their technical condition. In case of a *cascaded layout of hydro junctions*, for the calculations of the designed hydro junction spillway and other structures, the position of the structure in the cascade and the discharges released by the hydrotechnical structures situated above at the normal and maximum headwater level have to be considered. In addition, the rules for the use of the above structures and cascade storage facilities as well as the inflow of water into the upstream of the future hydroelectric junction need to be assessed.

Technical Regulation for Construction STR 2.05.19:2005 [7] “**Engineering hydrology. Basic calculation requirements**“ states that in rivers with *cascades of reservoirs or hydro junctions*, the maximum discharges must be calculated by estimating the impact of the upper hydro junctions on the lower ones and the runoff of the tributaries in that section.

Typical regulations for the use and maintenance of water reservoirs (LAND 2-95) [8] require to present and consider the influence of the other (*above and below*) reservoirs on the operation regime of the reservoir as well as the influence of the reservoir on the operation regime of other reservoirs (*below and above*). This document requires during the dry period of the year to release downstream the impoundment not smaller amount of water than

environmental discharge (i.e. the mean of minimum discharges of 30 days in the low period (May-October) with 80% or 95% probabilities).

Procedures **For issuing authorizations to reduce the water level in reservoirs and dammed lakes** [9] and **For environmental flow calculation** of the Minister of Environment [10] do not mention cascades of hydrotechnical structures.

3.2. LATVIA

A definition of a cascade of HPPs is provided in the **Regulation No. 505** (01.09.2015) [11]. According to this Standard, a *HPP cascade* consists of several HPPs situated on the same river, at such a distance that functioning of one of the HPPs poses a risk to, or impacts the functioning of another HPP. Provisions of this Standard, with regard to designing hydrotechnical constructions operating in cascades in such a manner as to allow their coordinated work under different hydrological conditions, or designing class A hydrotechnical constructions in such a way as to allow them to work, whenever possible, in natural inflow operation mode, thus ensuring minimum guaranteed flow or ecological flow downstream, however, do not consider HPPs of class B (where the majority of small HPPs belong) or class C.

Regulation No. 329 (30.06.2015) [12] provides the definition of minimum guaranteed flow and E-flow, and states that natural conditions of the river should be preserved to maximum possible extent during low flow periods, but does not include any specific requirements to HPP cascades.

According to the **Regulation No. 736** (23.12.2003) [13], Regional Environmental Board, while defining terms of use of water resources to be included in the water use permit, takes into account the *sufficiency of water resources* in the water body, as well as operation of *other water users*. Permit for the operation of hydrotechnical constructions must include:

- values of water level in the HPP reservoir (backwater), as well as allowable water level regime and water level fluctuations;
- values of the minimum guaranteed flow and of the E-flow, as well as technical prerequisites to ensure these values.

When defining the requirements for water level and water flow for small HPPs, Regional Environmental Board takes into account the following:

- at the tail race, and in the whole river stretch impacted by operation of the HPP, minimum guaranteed flow has to be provided;
- E-flow has to be provided instead of minimum guaranteed flow, in cases when there is (a risk of) negative impact on fish populations or damage to water ecosystems.

There are no specific requirements in the Regulation No. 736 for the class B or class C HPPs operating in cascades. Precise criteria for setting such requirements in concrete water use permits could be a technical material not available publicly.

It has to be mentioned that water use permits issued to small HPPs have to be *revised* once per 7 years. In real practice, however, no strict requirements are foreseen in the Regulation No.736, with regard to the permit revision. This leads to situations when “new” permits are issued identical to “old” ones, despite the fact that Ecological flow values should be revised based on the newest available information and calculation methods. There have also been cases in real practice when certain recommendations of fish experts / aquatic habitat experts are available for a particular river stretch, but these recommendations do not immediately lead to revision of the requirements set in the HPP water use permit.

Another practical aspect is the possibility to mitigate the impact of small HPPs on aquatic fauna by installing *fish passes*. At the present moment, installation of fish passes is not required “by default”, see Section 25 (3) of the **Water Management Law** [14]:

“In issuing a permit for the operations of hydrotechnical structures, the regional environmental board shall include in the conditions thereof a requirement to perform necessary fish resources protection measures, including the opening of sluices or ensuring *construction of a fish pass* in the dam of the water body if the relevant measures are *necessary biologically well-founded* in accordance with the opinion of a fisheries expert-examination, *as well as engineering-technically possible* in accordance with opinions provided by a specialist who has acquired the qualification of a hydro-technician with experience in the

operation of hydrotechnical structures and persons who in accordance with the Construction Law have the right to perform the design of hydrotechnical structures.”

In practice, nevertheless, HPP dams pose a significant obstacle to migration of aquatic organisms, therefore installation of fish passes can be seen as a necessary and biologically well-founded measure in the vast majority, if not all, hydropower plants.

IV. RECOMMENDATIONS FOR AMENDMENTS TO NATIONAL WATER LEGISLATIONS

Taking into account the results of analysis of national legislative acts, as well as results obtained within other work packages of the TRANSWAT project, it is possible to propose the following recommendations for the improvement of national legislative systems.

4.1. LITHUANIA

Brief recommendations after the analysis of the legislative system of Lithuania and the modelling results are the following:

1. The screened documents mention the concept of hydrotechnical structure (HTS) cascades but none of them provides a definition for such a layout of hydrotechnical structures. This definition should be included in STR 2.02.06:2004 *Hydrotechnical structures. Basic provisions* [6].
2. STR 2.02.06:2004 [6] should consider HTS cascades as a special case and require using the modelling methods to accomplish hydraulic, hydrodynamic and infiltration calculations to operate this entire layout of HTSs effectively.
3. In the future, in the *Procedure for environmental flow calculation* [10] and in STR 2.05.19:2005 [7], the concept of environmental flow could be replaced by the concept of ecological flow (E-flow) regime. The new *Procedure for calculating the ecological flow regime* should also include cases of HPP cascades.
4. Instead of LAND 2-95 [8] (which obliges the HPP owners to create Regulations for the use and maintenance of HPP reservoirs), a new system of *permits for HPP exploitation* should be created. The permits should be revised periodically, considering the water body's ecological state. If the state does not correspond to good ecological potential, measures to improve the ecological state should be proposed. One such measure could be the examination of the effectiveness of fish passes.

5. The methodology for releasing the transit discharge below the dam using the data of water level gauges above and below the HPP should be created.

4.2. LATVIA

Main recommendations for Latvia are as follows:

1. Consider the possibility to provide a more informative definition of HPP cascades in the Regulation No. 505 [11].
2. It seems reasonable to provide differentiated requirements for the class B and class C hydropower plants operating single or in cascades, in the legislative acts such as Regulation No. 329 [12] and No. 736 [13].
3. Regulation No. 736 states that the flow that has to be provided “by default” at the tail race and in the impacted river stretch is *minimum guaranteed flow*. Requirement to provide *ecological flow* comes into effect if there is an expert conclusion on the (risk of) negative impact. HPP cascades usually have a major impact on the river system, therefore it is reasonable to include the requirement to provide ecological flow regime for small HPP cascades. It is the ecological flow regime, not the minimum flow, which should be provided “by default”. Instructions for calculation of the ecological flow for the cascades of HPPs are provided in the TRANSWAT project deliverables.
4. There should be a strict requirement in the Regulation No.736 that a conclusion of a fish expert / aquatic habitat expert (mentioned in Article 6.2.2 and Article 6.2.6 of this Regulation) is *necessary* for the elaboration of revised HPP operation permit (once per 7 years). The conclusion of the fish expert / habitat expert should also be recognized as a *legitimate basis* for the revision of a previously issued permit.
5. It should be stressed that it is not just E-flow (constant value) but Ecological flow regime (dynamic through the year) that has to be provided in the river ecosystem. Additionally, general phrases in the Regulation No.736 regarding “negative impact on aquatic environment” should be replaced with something more precise and measurable.
6. Section 25 (3) of the Water Management Law [14] should be updated, excluding the text “necessary biologically well-founded in accordance

with the opinion of a fisheries expert-examination”, thus ensuring that installation of fish passes is the necessary prerequisite for the operation of (small) hydropower plants, if technically possible. Additionally, Article 36.6 and Article 36.9 of the Regulation No.736 should include general requirements for the fish passes, to be included in the HPP water use permits; such as general construction requirements (e.g. natural or semi-natural fish passes), and exploitation requirements (e.g. ensure free and continuous water flow in the fish pass, with the minimum flow requirements for summer and winter season; requirement to take out from the fish pass any obstacles (large stones, woody debris, etc.)).

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