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Joint management of Latvian – Lithuanian trans-boundary river and lake water bodies (TRANSWAT) LLI-533

REVIEW
OF NATIONAL LEGISLATIONS
IN THE FIELD OF WATER USES

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Abbreviations

ECOSTAT	WFD CIS working group on Ecological Status
E-flow	Ecological flow
EU	European Union
HMWB	Heavily modified water body
HP	Hydropower
HPP	Hydropower plant
HTS	Hydrotechnical structure
MW	Megawatt
RBMP	River Basin Management Plan
WFD	Water Framework Directive
WFD CIS	Water Framework Directive Common Implementation Strategy

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I. INTRODUCTION

This review has been done in the frame of the project “Joint management of Latvian – Lithuanian trans-boundary river and lake water bodies” (TRANSWAT) LLI-533 financed by the Interreg V-A Latvia–Lithuania Programme 2014-2020.

Hydropower is regarded as one of the most important renewable energy sources, but it solely depends on water resources and the hydrological cycle. Finding the balance between human (energy production) and environment (suitable habitat for aquatic species) needs is a complicated objective. The EU Member States identify hydropower and dams amongst the main drivers causing the degradations of the aquatic environment [**1**; **2**]. The requirements of the key EU environmental legislation set out in the Water Framework Directive [**3**], the Birds and Habitats Directives [**4**; **5**], and the Environmental Impact Assessment Directive [**6**] intend to regulate the use of hydropower resources.

The listed EU Directives, as well as WFD CIS Guidance Documents No 4, 31 and some other legislation documents, stress the need to ensure **ecological flow** regime in order to achieve good ecological status of water bodies.

The concept of the ecological flow and corresponding requirements of the EU Directives and related legislative documents have been investigated in the course of the **ECOFLOW project** [**7**] (2017-2019, financed by the Interreg V-A Latvia–Lithuania Programme 2014-2020). The main objectives of the ECOFLOW project were to *evaluate the impact* of small hydropower plants on the ecosystems of transboundary rivers in Lithuania and Latvia, and *develop national methodologies* for the calculation of ecological flow (E-flow). The lead partner of the project was Latvian Environment, Geology and Meteorology Centre. Project partners were Institute of Food Safety, Animal Health and Environment BIOR (LV) and Lithuanian Energy Institute (LT). Deliverable T1.2.1 of the ECOFLOW project provides broad *analysis of requirements* regarding the ecological flows in EU legislation, as well as in the national legislative systems of Lithuania and Latvia. Deliverable T3.2 provides first *recommendations* for the *amendments* to national water legislative systems.

The **TRANSWAT project** (2020-2023) that can be seen as a “successor” of the ECOFLOW project is intended to further explicate the idea of ecological flow, with regard to *HPP cascades*. Corresponding legislative acts, both EU-wide and national, have been analysed in this context.

II. EU REQUIREMENTS REGARDING E-FLOW IN HPP CASCADES

WFD **Guidance Document No 31** “Ecological flows in the implementation of the Water Framework Directive” [**8**] is intended to support a shared understanding of ecological flows and ways to use them in the River Basin Management Plans (RBMPs). Based on the WFD and the WFD **Guidance Document No 4** on identification and designation of heavily modified water bodies (HMWBs) [**9**], river water bodies that have been severely affected by human activities should be distinguished as heavily modified. Instead of "good ecological status", the environmental objective for HMWBs is good ecological potential.

Physical alterations due to small-scale hydropower (usually < 10 MW energy production capacity; relatively small water storage dams) normally do not fulfil the requirements for the designation of HMWBs. River ecosystems deteriorate the most when *cascades of reservoirs* are installed. The term *cascade* here refers to two or more hydraulically coupled/connected HP plants located in a row on the same river. Over time, in such sections of the river, the lake fauna and flora begin to prevail. These changes occur regardless of whether or not fish barriers are equipped with fish passes. The installation of fish passes in reservoir cascades does not mitigate the impact, as almost no typical river fish species that could use these passages remain. The WFD requires Member States to protect and enhance all heavily modified water bodies to achieve good ecological potential. The flow regime to be implemented in these water bodies should be the closest possible to ecological flow. There are no specific requirements regarding the provision of E-flows, with regard to HPP cascades.

The **ECOSTAT report** (2016) on Common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water

bodies impacted by water storage [**10**] mentions several times “rivers characterized by chains of ponded reaches” and “rivers altered by several impounded reaches” as causing more severe environmental consequences.

The **Guidance** (2018) **on the requirements for hydropower** in relation to EU Nature legislation [**11**] that provides an overview of the EU policy and a legislative framework in which hydropower is expected to operate in Europe, emphasizes that if there are several HP plants in the catchment area, the risk of cumulative or combined effects should be considered.

III. NATIONAL LEGISLATIONS REGARDING E-FLOW IN HPP CASCADES

3.1. LITHUANIAN LEGISLATIVE FRAMEWORK

The Laws of the Republic of Lithuania on Water, Environmental Protection, Environmental Impact Assessment of Proposed Economic Activity and others (described in detail in the deliverable T1.2.1 of the ECOFLOW project) establish the policy on the use and protection of surface water resources. There are also many legislative documents related to planning, use and maintenance of HPPs and HPP dams. The following documents have been screened in order to find requirements for the operation of HPP reservoir cascades and flow regime regulation in the impounded rivers.

According to **Technical Regulation for Construction STR 2.02.06:2004** "Hydrotechnical structures. Basic provisions" issued by the Order No D1-538 (18.10.2004) of the Minister of Environment [**12**], the design, construction and operation of HTS must provide for and guarantee <…> the most appropriate regime for river flows, water levels and flow rates in the lower reaches, taking into account the interests of all water users and consumers. In rivers with a *cascaded layout of hydro junctions*, for the calculations of the designed (future) hydro junction spillway and other structures, it is necessary to assess the position of the structure in the cascade, the flow rates released by the hydrotechnical structures situated above at the normal and maximum headwater level. 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. The release of the main calculated water flow must not interfere with the use of the hydrotechnical structures below or impair their technical condition.

Technical Regulation for Construction STR 2.05.19:2005 "Engineering hydrology. Basic calculation requirements" issued by the Order No D1-458 (22.09.2005) of the Minister of Environment [**13**] states that the calculated maximum discharges of regulated rivers shall be determined on the basis of the natural runoff of that river and by estimating the transformation of the discharge due to existing reservoirs or economic activities in the river basin. 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. When calculating the *flow rates* for water spillways in hydro junctions forming cascades, the maximum probability flow rates for the lower junction shall be calculated by estimating the effect of the upstream hydro junction on the downstream and tributary flow in the section between the hydro junctions. When designing hydrotechnical structures, the model hydrogram of the flood runoff shall be selected common to the *entire cascade of reservoirs*, according to the hydrogram of the first reservoir (at its beginning) and the tributary hydrograms in the section between the first and last reservoir.

Typical regulations for the use and maintenance of water reservoirs (LAND 2-95) issued by the Order No 33 (07.03.1995) of the Minister of Environment [**14**] require that among the main hydrological characteristics at water spillway, 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 should be presented.

In the documents such as **Procedure for issuing authorizations to reduce the water level in reservoirs and dammed lakes** issued by the Order No D1-695 (22.12.2007) of the Minister of Environment [**15**] and **Procedure for Environmental Discharge Calculation** issued by the Order No D1-382 (29.07.2005) of the Minister of Environment [**16**], cascades of hydrotechnical structures are not mentioned.

The **Water sector development programme for 2017-2023** approved by the Decree No 88 of the Government of the Republic of Lithuania [**17**] stresses out that the ecological condition of rivers deteriorates the most when *cascades of reservoirs* are installed.

3.2. LATVIAN LEGISLATIVE FRAMEWORK

Water Management Law of the Republic of Latvia and related legislative documents establish the national policy in the field of management and protection of water resources. The Law on Construction, in its turn, aims to

create a living environment of good quality, determining efficient regulation of the construction process in order to ensure, *inter alia*, rational use of energy resources. Legislative documents related to use of HPPs have been screened, in order to list requirements for the operation of HPP reservoir cascades and flow regime regulation.

Regulation No. 505 (01.09.2015) of the Cabinet of Ministers of Latvia "On the construction standard LBN 229-15: Hydrotechnical constructions of class A hydropower plants" [**18**] provides a definition of a cascade of hydropower plants. 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. The Standard also stands that, when designing *hydrotechnical constructions operating in cascades*, their coordinated work should be foreseen under different hydrological conditions. When designing class A hydrotechnical constructions, technical solutions should be chosen that allow the HPP to work, whenever possible, in natural inflow operation mode, so that it is possible to ensure minimum guaranteed flow or ecological flow downstream HPP. Nevertheless, it should be taken into account that Regulation No. 505 applies to class A HPPs (these, according to the Law on the safety of hydrotechnical constructions of hydropower plants (07.12.2000) [**19**], are HPPs that, in case of failure, pose threat to life and health of people, inflict significant damage to property of physical or legal persons, and have significant negative impact on the environment) but does not consider HPPs of class B (where the majority of small HPPs belong) or class C.

Regulation No. 329 (30.06.2015) of the Cabinet of Ministers of Latvia "On the construction standard LBN 224-15: Amelioration systems and hydrotechnical constructions" [**20**] does not consider class A HPPs. This Standard provides the definition of minimum guaranteed flow and ecological flow (see more detailed description in the deliverable T1.2.1 of the ECOFLOW project), stating, *inter alia*, 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 operating in cascades.

Regulation No. 1014 (27.12.2005) of the Cabinet of Ministers of Latvia "Procedure for the elaboration of water body management regulations" [**21**] states that, in cases when it is planned to modify, due to economic activities, the hydrological regime or terms of use of a water body, new terms of use have to be developed, or existing terms of use have to be amended, obtaining approval from *all stakeholders*. This is relevant for cases where there are several HPPs within a water body.

Regulation No. 549 (12.07.2011) of the Cabinet of Ministers of Latvia "Regulation regarding water bodies where hydrological regime is regulated by means of hydrotechnical constructions" [**22**] states that additional information has to be included in the management regulations of a (hydrotechnically) regulated water body, namely: a) information on hydrotechnical constructions *placed in a cascade*, if there are any; b) rules for the operating conditions of a hydrotechnical construction, including the operator work schedule, if hydrological regime of the water body depends on the operation of *several hydrotechnical constructions*. Annex to the Regulation No. 549 lists 17 lakes and reservoirs which hydrological regime is controlled by hydrotechnical constructions.

Regulation No. 736 (23.12.2003) of the Cabinet of Ministers of Latvia "Regulations on water resources use permits" [**23**] states that Regional Environmental Board, while defining terms of use of water resources to be included in the permit, takes into account: a) *sufficiency of water resources* in the water body; b) operation of *other water users* in that water body. Water use permit for the operation of hydrotechnical constructions must include:

- the values of water level in the HPP reservoir (backwater), as well as allowable water level regime and water level fluctuations;
- the values of the minimum guaranteed flow and of the ecological flow, as well as technical prerequisites necessary to ensure these values (see more detailed description in the deliverable T1.2.1 of the ECOFLOW project).

When defining the above-mentioned requirements for water level and water flow for the hydropower plants with energy production capacity < 2 MW, 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;
- ecological 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 and terrestrial ecosystems that depend on them.

For the hydropower plants with energy production capacity of 2 MW or more, water use permit must also include the values of water level at the tail race, as well as flow rate during flood periods. Nevertheless, the majority of small HPP plants in Latvia have energy production capacity < 2 MW.

IV. CONCLUSIONS

4.1. CONCLUSIONS FOR LITHUANIA

The main conclusions after the analysis of the legislative system of **Lithuania** are the following:

1. The screened documents, by their nature, were expected to provide the order on how to ensure ecological flows downstream HTSs in their cascades. However, not all of the listed documents mention cascades of HTSs and none of them provides a definition for such layout of hydrotechnical structures.
2. According to the screened legislative documents, the main focus in the operation of cascades of HPP reservoirs is on their management in the case of maximum or flood discharges. While from an ecological point of view, the focus should be on minimum flows and ensuring that water-related communities have sufficient ecological flows downstream of each reservoir in the impounded river.
3. In line with the *Guidance on the requirements for hydropower in relation to EU Nature legislation*, national (Lithuanian) legislation should take into account the risk of cumulative or combined effects due to the operation of the HPP cascade.

4.2. CONCLUSIONS FOR LATVIA

The main conclusions after the analysis of the legislative system of **Latvia** are the following:

1. HPP cascades are mentioned in Latvian legislative acts to a quite limited extent. It is possible that the definition of HPP cascades provided in the Regulation No. 505 could be more informative. On the other hand, the definition of HPP cascades is very brief in the EU legislative acts, too.
2. No specific requirements are provided for the class B and C hydropower plants operating in cascades. Requirements regarding the river flow that has to be provided at the tail race and in the river stretch impacted by operation of the HPP (see Regulation No. 736) are not

differentiated depending on whether this is a single HPP or a HPP cascade.

3. It seems most realistic that detailed requirements for small HPPs operating in cascades are taken into account by Regional Environmental Boards, in the process of elaboration of water use permits. Precise criteria for setting these requirements could be a working material not publicly available on the Internet.
4. According to the Regulation No. 736, the flow that has to be provided "by default" at the tail race and in the impacted river stretch is *minimum guaranteed flow* (that is, average summer 30-days period low flow with 95% probability). Requirement to provide *ecological flow* comes into effect only if there is an expert conclusion on the (risk of) negative impact. Taking into account that *HPP cascades* usually have a major impact on the river system, it could be beneficial from the ecosystem functioning point of view to include the requirement to provide ecological flow "by default", in the case of small HPP cascades

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