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Hydropower and water management in Austria

What is the current status of implementing the EU Water Framework Directive?

Audun Ruud
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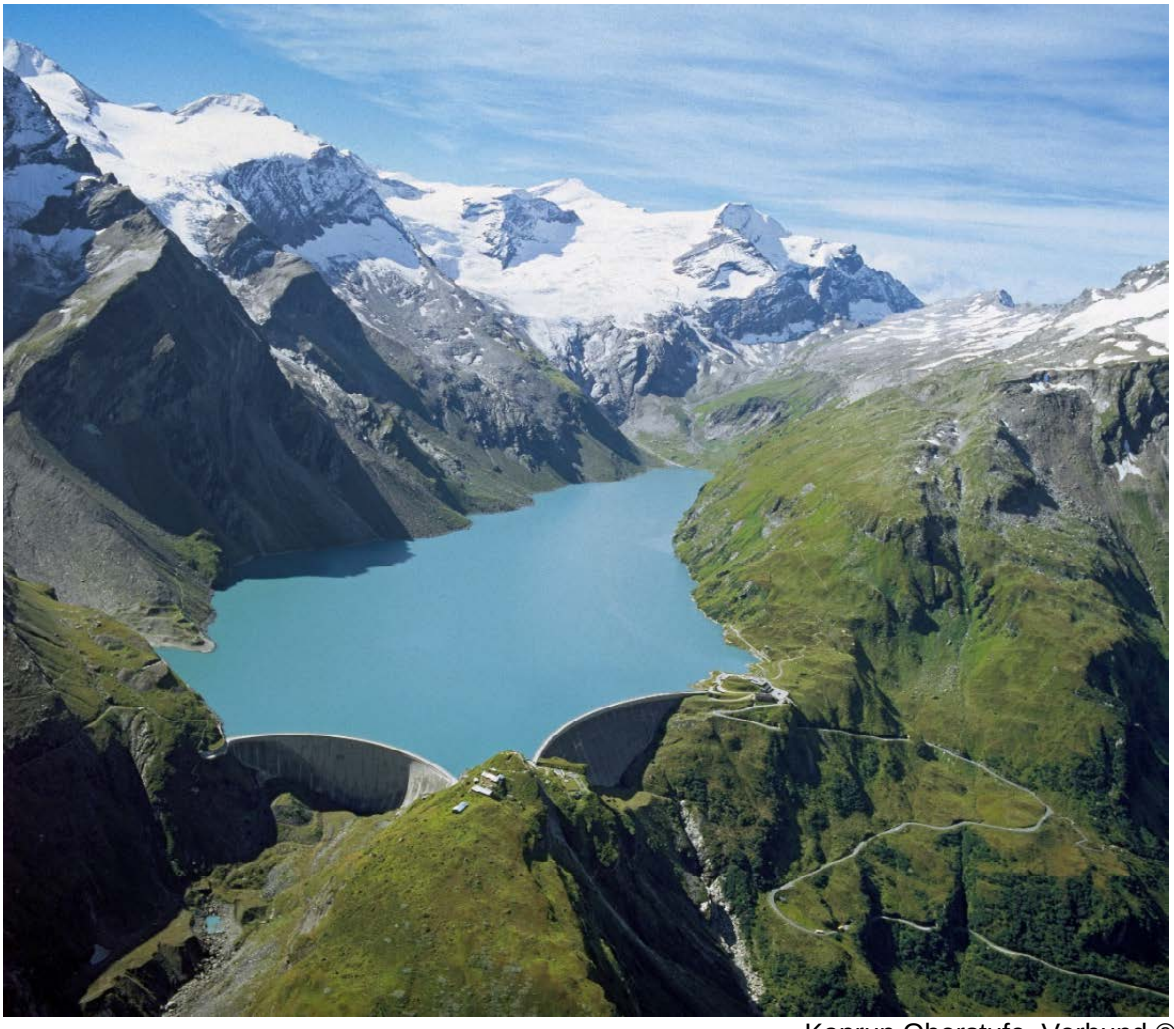

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Oslo, April 2018

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CEDREN – Centre for Environmental Design of Renewable Energy: Research for technical development and environmental impact of hydro power, wind power, power lines and implementation of environment and energy policy.

SINTEF Energy Research, the Norwegian Institute for Nature Research (NINA) and the Norwegian University of Science and Technology (NTNU) are the main research partners. A number of energy companies, Norwegian and international R&D institutes and universities are partners in the project.

The centre, which is funded by The Research Council of Norway and energy companies, is one of eleven Centre for Environment-friendly Energy Research (FME). The FME scheme consists of time-limited research centres which conduct concentrated, focused and long-term research of high international quality in order to solve specific challenges in the field of renewable energy and the environment.

Content

Abstract

Ruud, A. & Lindström, A. 2018. Hydropower and water management in Austria. What is the status of implementing the EU Water Framework Directive? NINA Prosjektnotat 65. Norwegian Institute for Nature Research.

Similarly to Norway and Sweden, hydropower plays a major part in Austrian electricity production. Hydropower development, and the issue of how to possibly exploit Austria's remaining potential is governed both by legal frameworks at European and national levels and it has been a source for political conflict since the 1980s.

In relation to the EU requirements, the Austrian government has formulated national energy targets. As with energy development strategies, there are also strategies and legal frameworks active at EU and national levels regarding environmental targets and standards to be achieved. The major piece of legislation steering this development that might be most in direct, perceived conflict with hydropower development is the EU Water Framework Directive (WFD) and the associated mandatory River Basin Management Plans (RBMP) that all member states are obliged to formulate and implement.

Austria started early on, already by the time of adopting the WFD, with producing studies to evaluate possible impacts to power production. This was translated into cost considerations, perhaps among the more critical issues of contention in relation to implementing the WFD with regard to hydropower. These studies came about as a part of a dialogue process with the hydropower industry. This has meant that Austria has been able to move beyond the first negative reactions of the industry to a more consolidated and jointly agreed financing model in the first RBMP.

However, Austria has received continuous criticism for vague descriptions of methodologies on criteria for designating Heavily Modified Water Bodies (HMWBs) and deciding Good Ecological Potential (GEP). Also, the application of exemptions has been criticized by the EU Commission and domestically for applying exemptions arbitrarily.

Austria has challenges in adopting the second RBMP in which new specific targets are to be set for the period 2016- 2021. Though not always smooth in implementing the EU WFD, the formula of continued dialogue to flesh out key issues and solutions, accompanied by related scientific studies will hopefully produce a way forward.

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Foreword

Stockholm Environment Institute (SEI) is no longer an active scientific partner in the SusWater project, but before Andreas Lindström left SEI for new challenges at the Swedish Environmental Protection Agency, he drafted a memo on the status of the WFD implementation in Austria.

This draft was left for others to follow-up and the SusWater project decided that this ought to be done.

The draft provided by Andreas has been revised and prepared for publication through the internal channels of NINA.

This NINA project report, however, is a result of and would not have been written without the solid groundwork provided by Andreas. Thank you for extending our knowledge on hydropower governance!

April 2018
Audun Ruud

1 Introduction

Similarly to Norway and Sweden (Lindström & Ruud 2017a), hydropower plays a major part in Austrian electricity production. Approximately 60 % of annual electricity supply comes from hydropower (BMWFD 2017). 71% of Austria's hydropower plants are run-of-river plants, 18% are storage and 11% are pumped storage plants (Wagner 2015). Austria's consumption of electricity is also – as in the case of Scandinavia, characterized by strong interaction with the neighboring countries – especially Germany, Switzerland, Czech Republic and Slovenia. Exchanges of electricity are of great importance for the national security of supply (BMWFD 2017).

Hydropower production, and the issue of how to possibly utilize Austria's remaining potential is governed by legal frameworks at European as well as on the national levels and it has been a source for political conflict since the 1980s (Pflüglmayer et.al 2008).

The EU Directive on Renewable Energy Sources (RES) sets targets in relation to the required share of renewable energy that each member state should achieve in its energy mix by specific dates (Lafferty & Ruud 2008). Austria is according to the directive bound to increase its renewable energy share from 23 % to 34 % by 2020 (Wagner et.al 2015).

In relation to the EU requirements, the Austrian government has formulated national energy targets. According to these, Austria was scheduled to increase its generation capacity from hydropower by approximately 3,5 TWh by 2015 of which an assessed 0,7 TWh could be generated through efficiency improvements (ibid). In capacity terms the Austria hydropower industry aims at adding another 1,000 MW by 2020. (IHA 2016). However, further expansion of hydropower production may have negative consequences for river ecology and morphology (Wagner 2015).

Similar to energy development strategies, there are also strategies and legal frameworks active at EU and national levels regarding environmental and water quality targets and standards to be achieved. A major piece of legislation steering this development that might be in conflict with the growth ambitions of hydropower development, is the EU Water Framework Directive (WFD) and the associated mandatory River Basin Management Plans (RBMP) that all member states are obliged to formulate and implement (Abazaj et.al 2016).

With regard to hydropower issues, this report aims to briefly inform the reader on the process and challenges of implementing the EU Water Framework Directive (WFD) in Austria. More specifically, it discusses the application of exemptions to the general rules in the WFD, as well as the challenges in developing and approving the second River Basin Management Plans (RBMP) which was published in August 2017.

2 Progression of the implementation of the WFD in Austria

Austria adopted its first River Basin Management Plan for its three major River Basin Districts in March 2010 (EC 2012). These three are Danube, Elbe and Rhine all of which are international sharing water courses with Czech Republic to the north, Germany to the north-east, Slovakia and Hungary to the east, Switzerland and Lichtenstein to the west and Slovenia to the south.[1]

Regarding this plan, Austria was commended by the EU Commission for having adopted approaches consistent with international coordination, not least with regard to aligning designation processes of Heavily Modified Water Bodies (HMWB) and Artificial Water Bodies with the Common Implementation Strategy (CIS) guidance.[2] It was further acknowledged that the plan showed a clear understanding of vital issues including hydromorphological pressures related to hydropower generation in Austria (EC 2015a).[3] However, Austria also received criticism for failing to produce enough details on the justification for applying time exemptions in relation to water bodies assessed to have significant hydromorphological impact (ibid).

2.1 HMWB and GEP

According to the Austrian Water Act there are explicit legal requirements to ensure river continuity and to ensure ecological flow (e-flow) in case of water abstraction (Wagner et al. 2015). Guiding values for ecological flow are legally set in the "Ordinance on ecological status assessment" ensuring that the biological values set for good ecological status are met with very high confidence.[4]

Austria, in large, follows the designation process for HMWBs as prescribed in the CIS guidance and supplied descriptions of perceived benefits from water using activities in the first RBMP as justification for water bodies declared as heavily modified (EC 2015a). The 2012 report from the EU Commission to the parliament on progress of implementing the WFD, stated that 7,7% of water bodies were designated as HMWB and 2% as artificial water bodies. It was noted that Austria only reported HMWBs when reaching Good Ecological Status (GES) would have "significant adverse" effect on hydropower generation (EC 2012:33).

A set of criteria assessing these pressures and impacts were formulated to decide when GES is to be considered as being compromised. These criteria relate to different aspects of water use in relation to hydropower, namely abstraction, hydropeaking, and impoundment. Abstraction relates to the removal of surface water from natural or artificial waterways for specific purposes such as hydropower production. Hydropeaking refers to the methods of satisfying sudden changes in demand for electricity where hydropower plants functions intermittently with sudden releases of water volumes creating periodic, very rapid and short-term fluctuations in the flow to the receiving water body. Impoundment means that the water body that is stored for hydropower generation for instance in a reservoir. The consequence will then be that the free-flowing system changes to a more static aquatic environment with potentially negative ecological impacts (EC

[1] More info at: http://ec.europa.eu/environment/water/participation/map_mc/countries/austria_en.htm. General info on the water policy in Austria is available in German at: https://www.bmnt.gv.at/wasser/

[2] Further info on the CIS guidance at: http://ec.europa.eu/environment/water/water-framework/objectives/implementation_en.htm

[3] For more info on the WFD: http://ec.europa.eu/environment/water/water-framework/index_en.html

[4] Information provided by Veronika Koller-Kreimel, Bundesministerium für Land und Forstwirtschaft, Umwelt und Wasserwirtschaft, Austria, May 19 2017.

2015b).

The Austrian assessment system allows experts to ascertain different values indicating that GES "would be ensured with very high confidence", a second set of values that "might lead to a failure of achieving GES and a third set of values where failure to reach GES is a certainty. However, recommendations from the 2012 EU-Commission report directed towards Austria included a statement that:

"the designation of HMWBs should comply with all the requirements of Article 4(3). The assessment of significant adverse effects on their use or the environment and the lack of significantly better environmental options should be specifically mentioned in the RBMPs. This is needed to ensure transparency of the designation process" (EC 2012:46).

This indicates that the Commission did not completely agree that Austria was in full compliance with regard to the designation processes of HMWBs. Consequently, in the fourth and latest report, issued in March 2015 (EC 2015a), it is evident that the Austrian designation process for HMWBs automatically assigns this status to any water body below storage lakes or dams for hydropower production. Thus, the Commission urged Austria to "improve the revision of the designation of Highly Modified Water Bodies and methodologies for establishing Good Environmental Potential" (EC 2015a:86)[5].

Another recommendation with clear implications for the hydropower sector (concerning minimum water flows), stated the necessity to:

"provide a clear commitment in the second RBMPs to properly prioritize hydromorphological measures and to a review of hydropower permits as restoration measures and the establishment of an ecological flow downstream of hydropower plants to achieve good surface water status" (EC 2015a:86).

Good Ecological Potential (GEP) is in Austria identified by utilizing a tailored, water body specific approach consisting of both the CIS HMWB Guidance No 4 approaches based on establishing biological reference conditions as well as the Prague approach [6]. The Prague approach which departs from identifying practicable mitigation measures, were used to establish the reference condition Maximum Ecological Potential and centered on sensitivity analyses of specific fish species and other biological Quality, and benthic invertebrates affected by hydromorphological change. Hydropower was the main activity for which the GEP concept has been used.[7]

2.2 **Application of exemptions**

As described briefly above, implementing the WFD has led to challenges for Austria in terms of evaluating status. Specifically in water bodies identified as having considerable hydromorphological pressures that at the same time produce considerable socio-economic goods in the form of electricity generated from hydropower plants, there are opportunities in the WFD to seek and apply exemptions to timelines and quality requirements.

In comparison to other legitimate exemption types, however, Austria has very often utilized exemption 4.4 "the extension of the deadline, in other words, good status must be achieved by 2021 or 2027 at the latest or as soon as natural conditions permit after 2027" (EC 2009).

[5] Available at: http://ec.europa.eu/environment/water/water-framework/impl_reports.htm#fourth
[6] According to Veronika Koller-Kreimel as per May 2017.
[7] Ibid.

In only five cases related to surface water bodies has article 4.5 - the need for less stringent standards - been cited for exemption as applied only for specific cases mainly related to pollution in Austria. In comparison, according to EC (2015) article 4.4 has been cited in 11 800 cases cited for failing water quality targets in waterbodies. The most common reason for this is due to "technical feasibility" which has been cited in 4015 cases (ibid). This is due to the required potential for removal and restoration of a significant number of barriers in watercourses. Almost as frequently cited reason for utilizing a phased approach is that of "natural conditions do not allow timely improvement in the status of the body of water", which have been listed in 4012 cases in the EU (ibid).

Disproportionate costs of carrying out improvement in a timely manner prescribed in the WFD, were cited in 3773 cases (EC 2015a). Article 4.7, about the "failure to prevent deterioration from high status to good status of a body of surface water as the result of new sustainable human development activities" and exemption from the "no further deterioration clause", was utilized two times in the 1st RBMP, in both cases related to new hydropower development projects (EC 2012).

Finally, with regard to exemptions, there were specific recommendations from the EU Commission for Austria in the 2015 report on the implementation progress (EC 2015a). Specifically, with regard to article 4.5 there were requirements to "make clearer the approach regarding exemptions" in the RBMPs on methodology applied for defining technical feasibility and disproportionate costs as well as to provide clearer explanations "on implementation measures for planned new hydropower development" (Op cit: 86).

3 Challenges to adopt the second RBMP in Austria

The EU Commission raised several concerns on the WFD implementation in Austria (EC 2015a) and Austria has had challenges in adopting the second RBMP in which new specific targets were to be set for the period 2016- 2021.[8] A draft of the second RBMP was presented on January 1st, 2015.[9] The draft was subsequently sent out for public hearing to be concluded by July, 2015. and a renewed draft was to be finalized by December 31st that year. [10] Common issues in the public hearing process were related to concerns expressed in Norway and Sweden in relation to hydropower, hydromorphological alterations and negative ecological impacts.

Since the 1980s, environmental interest groups in Austria have in general expressed concerns against new construction of hydropower (Pflüglmayer et.al 2008). Still, there is an intense debate on the use of the remaining hydropower potential in Austria and many large hydropower projects have been postponed or even cancelled (Wagner 2015). Demands are rather made that new hydropower generation capacity shall rather come from modernizing and improving efficiency of existing plants (ibid). There is also a concern amongst the environmental community – as reflected in the comments from the EU-Commission, that there has been an excess identification of HMWBs and a too relaxed granting of exemptions going against the "no further deterioration" clause of article 4 of the WFD.[11]

When it comes to financing environmental measures, there has traditionally been a broad consensus and acceptance of public financing subsidies to the hydropower industry to implement environmental measures. The first RBMP implementation phase had a total of 140 million EUR earmarked for the financing of environmental improvement measures for the rehabilitation of degraded hydromorphological conditions[12] related mainly to hydropower and impacts of flood protection measures.

A phased approach is applied for e-flow restoration. In the first step a base flow has to be provided also guaranteeing the passage in rivers for fish and in a second step a more dynamic flow. Losses of electricity production due to restoration of e-flow were not refunded by the subsidies. In the first RBMP in 2009, a prioritization approach was applied for implementing measures to improve hydromorphological conditions such as establishing river continuity, a base flow and eventual morphological measures. In this context, priority rivers (or defined stretches of rivers) were defined and identified. In these priority areas, obligatory restoration of river continuity and base flow was defined to be implemented by 2015. However, morphological improvements were only realized on a voluntary basis. Specific ordinances on provincial levels defined the frame conditions for the obligatory measures (for example the fish species for which the fish migration aids have to be designed for or the concrete base flow requirements). They also include a deadline for submitting the restoration project – otherwise permits would expire.

Priority rivers were also defined for the second RBMP, but only for voluntary measures to improve hydromorphological conditions. Besides, the public funding mechanism came to an end in 2015. Since then, there has been no specific public funding scheme proposed for structural

[8] More info at: http://ec.europa.eu/environment/water/participation/map_mc/countries/austria_en.htm or http://ec.europa.eu/environment/water/participation/map_mc/map.htm

[9] Water management in the Danube region: 3/2015." Aquamedia.at. Web. 03 May 2017: http://www.aqua media.at/epaper/2015/32015/

[10] Ibid.

[11] Ibid.<http://www.aquamedia.at/epaper/2015/32015/>.

[12] According to Birgit Vogel, EIP Water Austria. Telephone interview. 17 May 2017.

mitigation measures to improve river continuity and the river morphological situation. This is not covered in the second RBMP cycle. Therefore, those restoration/mitigation measures will have to be done only voluntarily or if a new permit is needed (due to expiring of date or change in use).[13]

The hydropower sector has from early stages been involved in a continued dialogue process and knowledge generating activities managed by the Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft. Particular issues that have been explored and studies have been conducted. Guidelines are proposed as well as setting of targets for minimum environmental flow and hydropeaking. Some of these major projects are coming to completion in 2017.[14]

The second draft RBMP has been completed. It was sent to the EU commission by the end of June 2017 and was subject to small adaptations due to the political discussions with the Austrian coalition partner at that time. The reason for the delay was mainly the discussion on how to finance the required measures to mitigate hydromorphological impacts. A funding scheme had been part of the first RBMP, but this was not included in the second. Despite this, the second RBMP was officially published in August 2017.[15]

Operators will have to carry out feasibility studies for schemes that cause hydropeaking impacts before 2021, demonstrating the technical feasibility of mitigation measures at the specific site, ecological effectives, effectiveness of measure combinations, economic costs and other socio-economic effects/impacts which will form the basis to define GEP by the water authorities. However, the measures would not be set before 2021 and would be done in close cooperation with the regional government and the responsible ministry.

[13] According to Veronika Koller-Kreimel as per 19 May 2017.
[14] Ibid
[15] Further details: https://www.bmnt.gv.at/wasser/wasser-oesterreich/plan_gewaesser_ngp/nationaler_gewaesserbewirtschaftungsplan-ngp/ngp2015.html. A change in ministerial structure as per January 8, 2018 – into: sustainability and tourism – including both water and energy. URL: https://www.bmnt.gv.at/

The discussion on financial responsibility among hydropower operators have evolved and there is now a more comprehensive acceptance from the industry of accepting costs for environmental improvement measures. This is mainly due to the mentioned stakeholder dialogue process that has been conducted and in which studies on potential losses in hydropower production were assessed, consolidated and agreed upon.

In Austria, as in Norway and Sweden, there are no direct financial costs for hydropower companies of using water resources per se. However, there are negative ecological consequences due to abstraction, hydropeaking and impoundment caused by hydropower production. In order to minimize negative effects on the ecology as well as production patterns, Austria is following what the Ministerial representative terms "a phased approach based on ecological as well as administrative and economic criteria".[16] Apparently, efforts are made to share the financial burden on hydropower producers through limiting the costs of improving the ecological impacts. This, however, causes expressed concerns both by environmental NGOs in Austria as well as the EU-Commission.

[16] According to V. Koller-Kreimel, op.cit.

4 Towards reconciling energy and environmental policy objectives in Austria?

Austria have made progress on hydropower in relation to implementing the WFD as much as hydropower interests and concerns are taken into account. However, there are also some major persistent problems among those expressing a concern for negative environmental impacts. Concerns for economic growth and security of supply to a large extent prevails as a direct conflict to environmental protective measures. These separate and possibly contradictory notions exist at different levels in Austria creating challenges for reconciling energy and environmental policy objectives in Austria.

If considering the national level and the critical inter- sectoral dialogue on tradeoffs between environmental and socio-economic values and concerns, Austria seems to be at another stage compared to Norway and Sweden. Concerns for safeguarding the energy system and security of supply have allowed for stringent measures to allow hydropeaking despite documented negative environmental impacts. Energy policy concerns seems to be prioritized at the national scale in Austria

Regarding potential funding schemes for financing environmental measures, Austria seemingly aims to ask those responsible for the environmental impacts to finance mitigating measures without public financial support. This seems – in principle, to have gained acceptance by the hydropower industry. However, a main reason for delays in adopting the second RBMP was in part due to discussions on financing. In the first RBMP the government offered a funding for environmental mitigating measures, but this was not followed up in the second drafted RBMP. Consequently, the industry got concerns for the potential financial obligations of funding mitigating environmental measures.

Austria started early on, already when adopting the WFD, to study and evaluate potential socio-economic and environmental impacts of implementing the Water Framework Directive. Among the more critical issues of contention was with regard to hydropower, but a dialogue process was initiated with the industry on cost sharing and funding schemes. This enabled Austria to move past the first negative reactions of the industry to a more consolidated and jointly approach. Similar attempts with cross-sectoral dialogue, have also been conducted in Sweden (Lindström & Ruud 2017b). Indications point in the same direction, that a more mutual understanding is emerging. Despite starting from very polarized positions, current efforts aimed towards win-win solutions (Lindström & Ruud 2017a).[17] Though not always smooth, the formula of continued dialogue to flesh out key issues and solutions and accompanied by related scientific studies seems to have produced a way forward in otherwise locked positions in some of the most hydropower dependent countries in Europe. Hopefully, this will also be the future case of Austria.

[17] For more info on Sweden, more details at: https://www.sei-international.org/publications?pid=3148

From the above section, it can be assumed that internally, Austria has been able to sort out some of the more contentious areas regarding hydropower and the WFD, by pursuing what we can term as liberal applications of defining HMWBs and through extensive use of exemptions to the timelines. However, Austria is facing compliance issues in relation to the EU on implementation of key concepts of the WFD. This is in large part due to issues concerning hydropower.

Austria has received continuous criticism for vague descriptions of methodologies on criteria for designating HMWBs and deciding on GEP. Also, the application of exemptions has been criticized both from the EU Commission for the lack of detail for justifying exemptions but also domestically for the usage of exemptions that are perceived not to be in accordance with the WFD commitments. If this is due to political priorities of the government up to this point or if it is a sign of potential ambitions to "simplify" the implementation process in what is possibly the most hydropower- dense country in the EU, where more strict interpretations might cause severe systemic bottle necks, is difficult to assess fully. However, the wide usage of the 4.4 exemption (the extension of the deadline) is arguably related to the massive number of restoration projects needed, with associated permitting processes. So are for example 28000 migration barriers to be restored in Austria and successful implementation of these within a few years, is not deemed feasible. How Austria addresses these issues when eventually adopting the second RBMP might provide indication in one way or the other. It is however likely to assume that Austria has continued to designate more HMWBs according to the criticized standards since the last assessment indicating the number of total HMWBs at 7,7 % as share of total number of water bodies.

Potential target conflicts between renewable energy production and environmental objectives directly linked to the WFD has been identified. Despite a relatively high exploitation of existing hydropower potential Austria and particularly the hydropower industry has plans for further development, not least due to implementation of targets in line with the RES (IHA 2016). However, due to conflicts causing political challenges in realizing new power plants Austria seeks to achieve gains through refurbishments and efficiency improvements in existing plants as well as strategic use of pumped storage hydropower schemes. This is initiated particularly to strengthen the hydropeaking capacity, but concerns are raised whether the hydropower objective is part of the RES ambitions in Austria (Wagner et.al 2015). Still, Austria is also committed to the obligations of the EU WFD and despite an active application of exceptions there are environmental policy objectives to be met.

5 References

Abazaj, J., Moen, Ø. & Ruud, A. 2016. Striking the Balance Between Renewable Energy Generation and Water Status Protection: Hydropower in the context of the European Renewable Energy Directive and Water Framework Directive in *Environmental Policy and Governanc*e, 2016, volume 26, issue 5, pp 409-421

BMWFD. 2017. Energie in Österreich, Zahlen, Daten, Fakten. Bundesministerium für Wissenschaft, Forschung und Wirtschaft, Vienna. Url: https://www.bmdw.gv.at/EnergieUndBergbau/Energiebericht/Seiten/default.aspx

EC. 2009. Guidance document on exemptions to the environmental objectives, No 20, Url: https://circabc.europa.eu/sd/a/2a3ec00a-d0e6-405f-bf66-60e212555db1/Guidance_documentN%C2%B020_Mars09.pdf

EC. 2012. Report on the progress in implementation of the Water Framework Directive Programmes of Measures, available at: http://ec.europa.eu/environment/water/water-framework/impl_reports.htm

EC. 2015a. Report on the progress in implementation of the Water Framework Directive Programmes of Measures, available at: http://ec.europa.eu/environment/water/water-framework/impl_reports.htm

EC 2015b Ecological flows in the implementation of the Water Framework Directive: guidance document no. 31. Luxemburg: European Union. Url: https://circabc.europa.eu/sd/a/4063d635-957b-4b6f-bfd4-b51b0acb2570/Guidance%20No%2031%20-%20Ecological%20flows%20%28final%20version%29.pdf

IHA. 2016. Hydropower status report 2016, International hydropower association, London – UK.

Lafferty, W. & Ruud, A. 2008. *Promoting Sustainable Electricity in Europe. Challenging the Path Dependence of Dominant Energy Systems* Edward Elgar: Cheltenham - UK

Lindström, A. & Ruud, A. 2017a: "Whose Hydropower? From Conflictual Management into an Era of Reconciling Environmental Concerns; A Retake of Hydropower Governance towards Win-Win Solutions?" in a special issue of *Sustainability* on Hydropower, 2017, 9, 1262: http://www.mdpi.com/2071-1050/9/7/1262

Lindström, A & Ruud A. 2017b. Swedish hydropower and the EU Water Framework Directive with Andreas Lindström, Project Report 2017 – 01, Stockholm Environment Institute: https://www.sei-international.org/publications?pid=3148

Pflüglmayer, B., Nopp, C., Lauber,V, & Narodoslawsky, M. 2008. Austria: an "incidental front runner" faces new challenges. In Lafferty & Ruud.

Wagner, B, Hauer, C, Schoder, A & Habersack, H. 2015. A review of hydropower in Austria: Past, present and future development in Renewable and Sustainable Energy Reviews 50: 304-314"

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