# Energy Transition in Norway, Sweden, and Portugal: Reconciling Conflicts Between Climate and Environmental Objectives in the context of Hydropower Production.

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## Foreword

This master's thesis is written as part of the requirements for the Joint Nordic Master Programme in Environmental Law, a collaborative effort by Uppsala University, the University of Eastern Finland, and the Arctic University of Norway. Throughout this program, comprehensive knowledge of environmental law at the international, regional, national, and local levels has been provided. Among the various facets of environmental law and policy, the significance of energy law in addressing climate change has become increasingly evident, particularly during the final semester of the program.

The study of energy law has been enlightening, deepening our understanding of the field and sparking a keen interest in further research. Consequently, this master's thesis focuses on the production of renewable energy sources, shedding light on the trade-offs involved, particularly in relation to biodiversity objectives. As a result, the reconciliation between promoting renewable energy and preserving biological diversity has emerged as a critical research topic for meeting the needs of a decarbonized society.

Given the environmental relevance of the energy transition and the numerous unanswered questions surrounding its successful implementation, the topic of energy transition was chosen for this thesis. In this context, exploring the experiences of Sweden and Norway becomes particularly intriguing. These two countries, along with the rest of the Nordic region, have earned an impressive reputation for their achievements in energy transition and biodiversity preservation. Analyzing their approaches can provide valuable insights for other jurisdictions to follow and help identify potential pitfalls to avoid.

**Abstract**

Promoting renewable energy and transitioning away from fossil fuels are crucial in combating climate change. However, the production of renewable energy often poses risks to biodiversity. For example, hydropower production, while contributing to the renewable energy share, can have significant negative impacts on aquatic ecosystems and the dependent ecosystems.

The European Union (EU) has played a leading role in global energy transition. It has implemented the Energy Directive and maintains water quality standards through the Water Framework Directive. These policies highlight the need to balance renewable energy production with biodiversity protection.

This thesis aims to analyze the overachievement, regarding energy targets, by Sweden and Norway, two prominent countries in Europe, to identify their best practices in promoting renewable energy while safeguarding biodiversity. Sweden and Norway are particularly relevant as they have long relied on hydropower production, which has been instrumental in their renewable energy generation. By comparing and examining the practices of these countries, valuable insights can be derived and offered as inspiration to Portuguese policymakers who are currently navigating the conflicting goals of renewable energy development and biodiversity conservation in their hydropower sector.

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**ABREVIATIONS**

**AWB** – Artificial Water Bodies

**CBD** - Convention on Biological Diversity

**CJEU** - Court of Justice of the European Union

**EDP** - Electricity of Portugal

**EEA** – European Economic Agreement

**EQSs** - Environmental Quality Standard

**EU** - European Union

**GEP** - Good Ecological Potential

**GO** - Guarantee of Origin

**HMWB** - Highly Modified Water Body

**MEP** - Maximum Ecologic Potential

**MER** - Modern Environmental Requirement

**NAP** - National Plan for Modern Environmental Requirements

**NECPs** - Integrated National Energy and Climate Plans

**NES** - National Electricity System

**NVE** - The Norwegian Water Resources and Energy Directorate

**PNBEPH** - National Portuguese Plan for Dams of High Hydroelectric Potential

**PoM** - Programme of Measures

**RBD** - River Basin Districts

**RED** - Renewable Energy Directive

**SEA** - Strategic Environmental Assessment

**SEC** - Swedish Environmental Code

**WFD** - Water Framework Directive

# 1 INTRODUCTION

## 1.1. Background (History)

The transition to renewable energy sources has become increasingly relevant in the context of the global energy transition.[1] High energy consumption is a characteristic of carbon-based societies, with fossil fuels maintaining their status as the primary source of energy.[2] However, the potential for irreversible environmental damage through carbon dioxide (CO2) [3] emissions necessitate a shift away from fossil fuel dependency. In this regard, hydropower has emerged as a prominent catalyst for the transition towards sustainable energy systems. [4] Yet, it is crucial to recognize that hydropower production carries inherent risks, including its impact on aquatic ecosystems.[5] Therefore, understanding the complexities and implications of hydropower within the broader energy transition landscape is essential for developing effective and sustainable energy policies.

The European Union's (EU) energy policies have at the forefront of progressive environmental policies, positioning the region as a leader[6] in the race towards decarbonization. However, despite these advancements, EU policies have yet to provide a comprehensive and final solution to the conflicts between promoting renewable energy for climate interests and protecting biodiversity for ecological interests.[7] Biodiversity objectives encompass the conservation of the "variability among living organisms from all sources," including "terrestrial, marine and other aquatic ecosystems."[8] The significant biodiversity damage that may be caused by large-scale renewable energy facilities creates a conflict between the promotion of renewable energy and the protection of biodiversity. Examples such as the ecological consequences of a wind farm, which has been deemed a potential "trigger for an ecological disaster" in Ireland,[9] and the adverse impact of extensive hydropower production on Swedish water bodies leading to

[1] Banet, 2012, p. 207.
[2] Hannah Ritchie, 2022.
[3] Daniel Bodansky, 2010, p. 37 and 38.
[4] International Energy Agency (IEA), Tracking report — September 2022.
[5] Hanssen, 2016, p. 3.
[6] COM (2021) EU's Global Leadership in Renewables Final synthesis report July 2021, p. 8.
[7] Jackson, 2011, p. 1196.
[8] Convention on Biological Diversity (adopted on 5 June 1992, entered into force 29 December 1993) 31 ILM 818, (hereinafter referred to as CBD). Article 1 and 2.
[9] Jackson, 2011, p. 1196.

biodiversity loss[10] highlight the complexities faced by EU Member States in finding an optimal solution.

Conversely, these policies exacerbate the existing conflict between biodiversity and climate change objectives. Considering the vast diversity of countries within the EU, each with unique conditions, it is crucial to research and understand how different Member States have successfully balanced the delicate interplay between climate change mitigation and biodiversity conservation.

EU Nordic Member States, such as Sweden and Norway, have made significant strides in the development of renewable energy production due to their unique environmental and political conditions. These countries had already distanced themselves from fossil fuels and started a path to secure their independence from imported oil and gas, much before the advent of EU energy policies and climate policies.[11] The construction of hydropower facilities experienced substantial growth in Sweden between 1918 and 1975, with the establishment of the last capacity increasing target during this period.[12] However, since 1975, there has been a heightened emphasis on environmental protection for Swedish rivers, leading to a de facto moratorium on further hydropower expansion.[13]

Similarly, Norway, another European country with a noteworthy history in energy transition, heavily relied on its own hydropower production as the primary source of electricity[14] since the 1950s. Norway embarked on a significant period of hydropower development, which continued until the 1980s. However, during this time, conflicts between hydropower development and environmental concerns intensified, also in Norway, raising important considerations regarding the balance between energy production and environmental preservation.[15]

The promotion of hydropower production and consumption plays a crucial role in facilitating the transition to renewable forms of energy, aligning countries with the implementation of EU

[10] Michanek and Zetterberg, 2021, p. 343.
[11] Lindström and Ruud, 2017, p. 3. See also Bodansky et al, 2017 p.10. "Climate change has been a major international issue since the late 1980s, and states have developed a significant body of international law in response."
[12] Stockholm Environment Institute, (SEI) (2011), p. 5.
[13] SEI (2011), p. 5.
[14] Ministry of Petroleum and Energy, The History of Norwegian Hydropower in 5 Minutes https://www.regjeringen.no/en/topics/energy/renewable-energy/the-history-of-norwegian-hydropower-in-5-minutes/id2346106/
[15] Alfredsen, et al., 2022, p. 276.

climate policy by moving away from carbon-intensive energy sources. However, as illustrated by Jackson, the implementation of climate policies often carries inherent risks that can directly or indirectly conflict with biodiversity policies, designed to safeguard and preserve biological diversity.[16] Recognizing the significance of reconciling these two objectives at the national level, the international community has acknowledged that the conservation of biodiversity[17] and addressing climate change[18] are concerns of humankind. These two fundamental environmental principles may intersect and create challenges when, for instance, the implementation of a hydropower plant project, undertaken to achieve climate change mitigation goals, threatens the natural ecological attributes of a river through damming, diversion, or both.

International agreements have a profound influence on the energy sector of the signatory parties, as they necessitate the reduction of emissions from conventional energy production and consumption to fulfill their commitments.[19] The Paris Agreement, to which the EU and its 27 Member States are parties, emphasizes the need for a collective "global response to the threat of climate change"[20]. This responsibility extends to the EU, Norway, Sweden, Portugal, and other participating states, obligating them to formulate and implement climate policies aimed at mitigating greenhouse gas (GHG) emissions, which significantly impact the energy sector.

In order to fulfill their obligations, the EU has devised energy policies that bind Norway, Sweden, and Portugal. However, there is an ongoing struggle to strike a balance between climate policy objectives and the maintenance and conservation of biodiversity, as highlighted by the Convention on Biological Diversity (CBD).[21] Norway, Sweden, and Portugal have incorporated EU policies to pursue their respective objectives. Norway is the largest producer of electricity from renewable sources in Europe, with a total installed hydropower generation capacity of 33.5 GW as of 2020.[22] Sweden had an installed capacity of 16.3 GW in 2021[23], while Portugal had a capacity of 7.3 GW in 2019. [24] These figures demonstrate the potential

[16] Jackson, 2011, p. 1196.
[17] Preamble of the CBD.
[18] Paris Agreement (adopted on 12 December 2015, entered into force 4 November 2016) 55 ILM (hereinafter referred to as Paris Agreement). Preamble.
[19] International Renewable Energy Agency (IRENA), (2020) Renewable Energy and Climate Pledges, Five Years After the Paris Agreement, p.2 and 4.
[20] Art. 2, of the Paris Agreement.
[21] Preamble of the CBD.
[22] IEA (2022) Norway 2022 Energy Policy Review, p.41.
[23] Swedish Energy Agency, Energy in Sweden 2022; An overview, p.7.
[24] IEA (2021) Portugal 2021 Energy Policy Review, p.126

for analysis and study of these three countries, particularly for Portugal, which aims to increase its installed capacity by 1.16 GW in 2023.[25] As Portugal progresses in hydropower development, it is crucial to reflect on best practices and learn from the experiences of the two seasoned hydropower producers, Sweden and Norway, in order to avoid potential shortcomings.

The policies discussed are embedded within the framework of EU legislation. The Water Framework Directive (WFD) [26], adopted in 2000, Composing part of the, the WFD is based on EU's environmental policy according to Article 192(1) of the Treaty on the Functioning of the European Union (TFEU),[27] has played a crucial role in restoring aquatic ecosystems and ensuring river continuity.[28] Sweden and Norway have transposed the WFD into their national laws. The Renewable Energy Directive (RED)[29], implemented in 2009 and based on Article 194(2) TFEU as part of the EU's energy policy and climate policy,[30] aims to promote renewable energy production and consumption.[31] Hydropower production has significantly contributed to the objectives of the RED, ranking as the second-largest source of renewable electricity in the EU.[32]

Understanding the complexities and trade-offs involved in renewable energy, particularly hydropower, as demonstrated by Sweden and Norway, can provide valuable insights for other Comparing the practices of these Nordic countries and identifying their shortcomings and achievements can guide the adoption or avoidance of specific practices by other jurisdictions. Although, Northern Europe is often praised for its advancements in energy transition,[33] it is important to acknowledge that the leading energy source for this transition, hydropower, also

[25] IEA (2021) Portugal 2021 Energy Policy Review, p.126.
[26] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. (OJ L 327, 22.12.2000, p.1), hereinafter Water Framework Directive (WFD).
[27] Langlet & Mahmoudi, 2016, p.224.
[28] Kampa, 2022, p. 3.
[29] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast), hereinafter (RED).
[30] RED has characteristics that place it as both energy policy and climate policy. However, it is primarily considered an energy policy because its focus is on promoting the development and use of renewable energy sources.
[31] SEI, (2011), p. 1.
[32] COM, Energy, Hydropower.
[33] Sovacool, 2017, p. 569.

poses significant challenges to the water status in Norway[34] and Sweden.[35] Portugal, for example, can benefit from analyzing these practices as it expands its hydropower capacity through the construction of a hydropower plant project.

In summary, the examples from Sweden and Norway demonstrate the complexities and trade-offs involved in the pursuit of renewable energy, particularly in relation to hydropower. Understanding how these countries have navigated these challenges can provide valuable insights for other EU Member States and contribute to the development of effective energy policies that reconcile climate change mitigation with biodiversity conservation. Thus, comparing the practices of the two Nordic countries and determining the shortcomings and achievements experienced by them provides a guidance on what practices have the potential to be adopted and what practices should be avoided by another jurisdiction. One country that can profit from the analysis of these practices is Portugal, which since 2015 has been expending its hydropower capacity through the construction of a hydropower plant on three dams, in a project that is planned to be completed by 2023.[36]

### 1.2.Purpose and Research Question

In light of the pressing need to decarbonize society, it becomes imperative to reconcile climate and biodiversity objectives. Countries such as Sweden and Norway offer valuable perspectives, given their extensive reliance on hydropower and ongoing transition towards an electrified society. Consequently, investigating the challenges and best practices encountered by these hydropowers pioneers can yield valuable insights for Portugal, which is currently in the process of expanding its hydropower capacity. This thesis aims to assess and analyze relevant laws and policies to identify practices that can be replicated or which should be avoided by the Portuguese policy maker. The goal is to select and understand which best legal practices related to hydropower harvesting can facilitate the reconciliation of climate and biodiversity policies. This work intends to compare and comprehend the potential for successfully transferring experiences and avoiding challenges experienced by Norway and Sweden to Portugal.

[34] Hanssen, et al 2016, p. 3. "Because about 70 per cent of Norwegian water courses are regulated for the production of electricity, hydropower has been rated as the most important stressor to the aquatic environment in Norway."
[35] Lindström and Audun, 2017, p. 1. "Sweden depends on hydropower. About half of all electric power generated in the country originates from hydropower resources."
[36] European Investment Bank (EIB), (2018) Tamega Iberdrola Hydropower and Storage Portugal.

To accomplish this objective, this thesis seeks to address the following research questions: Firstly, what are the best practices and shortcomings within Norwegian and Swedish policies that can be identified to guide Portugal's hydropower expansion? Secondly, can these best practices be considered transferable, taking into account the unique characteristics of each country, and potentially serve as a reference for Portugal's hydropower expansion?

### 1.3.Methodology

This thesis addresses the problem of the conflict between decarbonizing society and protection of biodiversity. Consequently, the research problem[37] that arises is the inherent incompatibility between energy resource extraction and ecosystem preservation.

The methodology employed in this thesis is the doctrinal legal research, aiming to present a comprehensive and accurate "description of the present state of positive law,"[38] in Sweden Norway and Portugal. To answer the research questions, it is necessary to firstly gain an understanding of the national legislation in Sweden, Norway, and Portugal. This understanding will be developed by first examining the implementation of the framework of EU environmental legislation within the legal and administrative systems of Sweden and Norway. Additionally, a comparative legal approach will be undertaken to analyze the "plurality of legal rules and institutions"[39] in the three countries. The objective behind analyzing the national systems is to identify measures that can be transplanted to international jurisdictions, particularly to Portugal, by proposing "legal transplants"[40] from the exporting models of Sweden and Norway to the receiving model of Portugal. Although there are academic voices that question the suitability of legal transplants in legal theory, this concept has been commonly practiced. [41]

To assess the transferability of Swedish and Norwegian legal models to Portugal it is necessary to analyze the accuracy of the legal implementation of the WFD and the RED by the two Nordic countries. While doing so it will be possible to determine whether their practices, measures and/or legislation should be borrowed by Portugal, to better comply with EU legislation. The

[37] Booth et al, 2003, p. 58 and 59.
[38] Taekema, 2010, p. 2.
[39] Ajani, 2019, p. 1282.
[40] Ibid.
[41] Ibid.

reason why these two Nordic countries are used as case analysis lies on their long history of hydropower exploitation.

Therefore, the aim of this thesis is to identify the best practices developed by Sweden and Norway while implementing conflicting EU directives, which can potentially offer Portugal opportunities to address or avoid conflicts between climate goals and biodiversity preservation. Consequently, the Portuguese legal framework will be analyzed and compared with the frameworks of Sweden and Norway to understand any deficiencies that may hinder Portugal's ability to fully reconcile the WFD and ED for achieving a sustainable energy transition.

To analyze relevant Swedish policies, the (*Miljöbalk)* Swedish Environmental Code (SEC), the (*Klimatlag*) Climate Act, the (*Vattenlag*) Water Act, as well as documents and reports issued by the Swedish Energy Agency, will provide a source of national policies to be analyzed in light of the EU directives. Similarly, in Norway, the Norwegian Water Act and reports from (*Norges vassdrags- og energidirektorat*) the Norwegian Water Resources and Energy Directorate (NVE), responsible for regulating hydropower facilities[42], will be analyzed. Additionally, documents issued by the Norwegian Ministry of Petroleum and Energy will provide a comprehensive landscape for understanding the of how national agencies may reconcile conflicting objectives. Investigation will also be conduct in the Portuguese legislation through the study of the (Lei da Água) Water Law, Law 15/2022. National Energy and Climate Plan 2021-2030

Considering that EU secondary law can be affected by non-binding instruments, these instruments will also be subject to analysis. Documents issued by national authorities will aid in mapping national policies. Furthermore, non-binding instruments issued by the EU will provide an analytical framework for this thesis. As "it is difficult to conceive a role for a legal transplant without considering how local institutions work,"[43] it is crucial to understand the similarities and differences in the national approaches to environmental legislation. This understanding will facilitate the identification of challenges, best practices, and potential legal transplants or borrowing opportunities. Consequently, practices with a higher likelihood of successful transplantation to Portugal will be selected, aiming to ensure the correct

[42] EFTA Surveillance Authority, Case 88013, *Concerning WFD compliance*. Letter from the Ministry of Climate and Environment, May 2022, p. 4.
[43] Ajani, 2019, p. 1283.

implementation of the WFD and the RED and minimize the impacts of renewable energy production on ecosystems.

Moreover, the study will draw on the most relevant articles and books in the field of legal scholarship to support the research.

The research methodology will adopt an internal perspective, aligning with the viewpoints of judges, lawyers, legislators, and citizens engaged in legal practice.[44] This perspective acknowledges the subject matter of this thesis and seeks to provide practical guidance for Portuguese policy makers. By doing so, this study intends to contribute to the understanding and application of effective practices in the context of the energy transition in Portugal.

Documents and information issued by the national competent authorities responsible for implementing the WFD and RED will play a relevant role to assess understand the structure of water and energy management in the compared jurisdiction. This will serve to determine whether "legal transplants" would be feasible.

Scientific publications will also be relied upon to assess the environmental impact of hydropower and determine what constitutes successful hydropower management. By drawing from these non-legal sources, a comprehensive evaluation can be made regarding the impact of hydropower on water resources.

### 1.4.Limitation

This thesis will primarily focus on the Swedish and Norwegian experiences as valuable sources of examples that can potentially be "legal transplants" or serve as cautionary practices to be avoided by Portugal. The policies of Norway and Sweden will be critically evaluated from a policymaker's perspective. Additionally, the thesis will investigate whether the EU provides any methods for Member States to reconcile conflicting EU environmental policies. The analysis of Norway will be limited to comparable measures and EU assessments since Norway is not an EU member. Therefore, certain comparisons, such as the EU assessment of Swedish and Portuguese implementation, will not apply to Norway. The objective is to identify potential transferable best practices or learning experiences from Norway and Sweden that could be applicable to Portugal. However, it is important to acknowledge that each country has unique conditions, which may pose challenges in directly replicating such practices. Therefore, in

[44] Taekema, 2010, p.7.

many cases, it may be more appropriate to encourage the adoption of suitable aspects of the analyzed policies rather than a direct transplant. It is also important to note that there is limited legal research in Portuguese hydropower regulation regarding the implementation of hydropower, and most of the work presented here will be an initial attempt to cover this gap. Furthermore, it is crucial to clarify that this thesis will specifically focus on the legal dimensions and will not address cultural factors.

By recognizing these limitations, the thesis aims to contribute to the understanding of effective strategies and legal frameworks in the context of energy transition, while also acknowledging the contextual nuances that may influence the applicability of certain practices.

### 1.5.Structure

Chapter 2 of this thesis delves into the relationship between Sweden, Norway, and the EU within the context of hydropower exploration. Moving on to Chapter 3, a more comprehensive analysis of the Swedish implementation of the WFD and the RED will be conducted. In Chapter 4, the Norwegian case will be analyzed, taking into account its unique characteristics. Finally, Chapter 5 will investigate the Portuguese approach to managing divergent EU policies. The thesis will conclude with a final chapter that summarizes the key findings and insights from the preceding chapters, providing valuable insights to Portuguese policymakers.

# 2 HYDROPOWER DEVELOPMENT IN SWEDEN AND NORWAY: RECONCILING ENERGY SECURITY, BIODIVERSITY CONSERVATION, AND EU POLICIES

Hydroelectric dams have significant impacts on terrestrial and aquatic biodiversity throughout their life cycle. The construction of reservoirs replaces natural river channels and adjacent habitats with aquatic environments, affecting the species that inhabit them. Dams and impoundments hinder the transport of sediment and organic matter, and they fragment aquatic species by blocking migration and dispersal. The degree of fragmentation and hydrologic alteration in a watershed determines the downstream effects, which can range from moderate to the complete loss of sensitive or migratory species.[45]

[45] Gracey and Verones, 2016, p. 414.

Fragmentation refers to the loss of hydrologic connectivity in lotic ecosystems, occurring horizontally (along rivers and floodplains), longitudinally (from headwaters to estuaries), and vertically (between rivers and groundwater). Hydropower operation with structural barriers, such as large dams, low-head dams, and weirs, contribute to longitudinal fragmentation. Additionally, reservoir filling leads to lateral fragmentation by, among other things, storing river flows and limiting nutrient exchange.[46]

According to recent studies fragmentation may be the most critical factor driving the rapid decline of freshwater biodiversity. While establishing a precise quantitative relationship remains challenging, qualitative research at regional and global scales supports the notion that fragmentation plays a central role in this decline.[47]

In cases where the conversion of lotic habitats to lentic habitats occurs due to dam construction, the recommended water management approach is the removal of dams. When alterations arise from disrupted corridors caused by dams, impoundments, and diversions, the literature suggests several measures. These include the removal of dams to restore the natural migration pathways for aquatic species, facilitating migration across dams and through power stations. Additionally, restoration efforts should focus on enhancing riparian and aquatic corridors to promote connectivity. Another important measure is the controlled movement of sediment from reservoirs to downstream deltas, which helps maintain ecological balance. These actions align with the recommendations found in the literature to address the negative impacts associated with altered corridors.[48]

However, it should be noted that many of the mitigation measures to address these impacts involve flow alterations, which may result in reduced power production. [49] Therefore, it is crucial to consider a balanced approach in water management that considers both renewable energy production and environmental conservation. This means adopting conservation measures that minimize power loss whenever possible, while also recognizing situations where preserving high biological interest justifies accepting some power loss. Striking a cohesive balance between these two objectives is essential during the decision-making process to ensure the sustainable coexistence of hydropower generation and environmental preservation.

[46] Ibid, 414 and 417.
[47] Ibid, p. 417.
[48] Renöfält, et al., 2009, p. 52 and 53.
[49] Ibidi, p. 49.

## 2.1 Navigating the Dichotomy: Balancing Energy Security and Biodiversity Conservation in Swedish Hydropower Development.

### *2.1.1 From Energy Security to Environmental Goals: Evolution of Swedish Hydropower.*

In the end of the 19th century, Sweden was already commencing its hydropower development, which provides an understanding of the Swedish hydropower history seniority. In fact, although the current drives for investments on and promotion of hydropower have been mainly environmental goals, Sweden was already discussing the energy transition from oil and coal to hydropower during the 1950s. At that time, haunted by the specter of the recent end of the second world war, all Swedish analysts agreed that to achieve energy security, expending hydropower production would be fundamental.[50] Thus, hydropower expansion policies had, from its inception, nothing to do with Swedish environmental commitments, which illustrates the relevance of the Swedish perspective to access the impact caused by the lack of environmental and biodiversity-oriented goals in the establishment of energy transition.

Likewise, the exclusive pursuit of energy security as the primary goal has likely resulted in extensive environmental damage and risks. Since the root cause for investments in hydropower was energy security rather than climate change mitigation, the original policies were not initially mindful of the holistic ecosystem approach required under EU commitments, for instance. The holistic ecosystem approach, advocated by those in favor, encompasses environmental protection, the safeguarding of healthy ecosystems, the preservation of biological diversity, and the achievement of sustainable development upon its implementation.[51]

Therefore, it is wise to question what changes have been made in the Swedish energy transition framework to align the process with environmental goals. Similarly, it is valuable to understand how this shift in perspective towards the protection of biodiversity has impacted the hydropower system, which serves as the cornerstone of Swedish energy transition goals.[52]

[50] Kaijser and Högselius, 2019, p. 161.
[51] Lackey, 1998, p.22.
[52] Gracey and Francesca, 2016, p. 417.

### *2.1.2 Environmental Challenges in Swedish Hydropower: Reconciling Energy Production and Biodiversity Conservation*

The shift in perspective towards the protection of biodiversity and alignment with environmental goals has prompted changes in the Swedish energy transition framework. The limited expansion of hydropower in Sweden today is influenced by the recognition of watercourses that hold special significance as protected national interests under Chapter 4, Section 6 of the Environmental Code, including the four designated national rivers.[53] While there is untapped potential within these watercourses, the focus has shifted towards ensuring the preservation of biodiversity and environmental integrity. This change in perspective is a result of the growing emphasis on climate policies and the need to balance energy production with environmental considerations. Efforts have been directed towards improving the efficiency of existing hydropower facilities and exploring small-scale extraction projects to meet the demand for renewable energy.[54] Michanek is of the opinion that the implementation of the certificate system, which provides subsidies for renewable energy extraction, has been instrumental in supporting this transition. Overall, the Swedish energy transition framework has adapted to incorporate environmental goals and prioritize biodiversity protection within the hydropower system, which remains a vital component of Sweden's energy transition objectives.[55]

### *2.1.3 Balancing Benefits and Drawbacks: The Debate on Hydropower and Biodiversity in Sweden*

Despite efforts to prioritize biodiversity protection, there are still voices challenging the trade-off between biodiversity and hydropower production. Advocates for hydropower in Sweden emphasize its continuous power extraction capability regardless of weather conditions, unlike wind and solar energy.[56] Additionally, hydropower is a renewable energy source that enables Sweden to fulfill its commitment to the EU RED.

On the other hand, opponents of hydropower raise concerns about its potential to disrupt natural hydro-morphological water status and trigger significant ecosystem changes. This has

[53] Michanek and Zetterberg, 2021, p. 344.
[54] Ibid.
[55] Ibid.
[56] SEI, (2011), p. 5. "There are a number of actors – mainly Swedenergy (SE) which is the stakeholder organization for the companies producing, distributing and trading electricity in Sweden – that are pushing for a review of this de facto halt in significant hydropower."

implications for various stakeholders, including reindeer herders, fishermen, and other aquatic users. [57] The ongoing debate highlights the complexity of balancing the benefits and potential drawbacks of hydropower in relation to biodiversity preservation and underscores the need for comprehensive evaluation and decision-making in Sweden's energy transition framework.

### *2.1.4 Pathways to a Comprehensive Approach: Harmonizing Climate and Biodiversity Goals in Sweden's Energy Transition*

In conclusion, the ongoing debate surrounding the trade-off between biodiversity protection and hydropower production in Sweden underscores the complexity of balancing these competing interests. Achieving a holistic environmental approach in Sweden's energy transition framework requires reconciling these divergent perspectives.

In this context, it is important to consider the EU WFD and the RED as relevant frameworks for guiding hydropower production in alignment with biodiversity preservation. However, it remains unclear whether the current guidance provided by the EU is adequate in addressing the specific challenges of aligning hydropower production with the preservation of aquatic biodiversity. Most existing guidelines primarily focus on either water quality objectives or renewable energy promotion, lacking a comprehensive approach that addresses the potential synergy between these two interests. The EU non-binding guideline on the requirements for hydropower in relation to EU Nature legislation will be further investigated in subchapter 2.3.

For now, it is important to make the point that to achieve the dichotomous goals of climate mitigation and biodiversity preservation, a more comprehensive and integrated approach is necessary. This could involve developing robust guidelines and strategies that consider the specific environmental concerns associated with hydropower and ensure the preservation of aquatic ecosystems. By striving for a balanced and integrated view of climate and biodiversity goals, Sweden, along with other EU member states, can work towards a more sustainable and environmentally conscious energy transition process that respects both the imperatives of renewable energy production and the preservation of biodiversity.

[57] The Swedish Society for Nature Conservation (SSNC), the Sami Associations and Fishery Boards and Associations are among some of the actors who voice concerns about hydropower projects that have negative impacts on biodiversity and ecosystems.

## 2.2 Balancing Energy Security and Biodiversity Conservation in Norway's Hydropower: Before and After EU policies.

### *2.2.1 Pioneering Hydropower in Norway: Historical Development and Industrial Advancements*

Norway initiated the development of large-scale hydropower production during the early 1900s. As early as 1911, Norway had begun construction on the world's largest hydroelectric power station. The availability of nearby hydropower resources played a significant role in facilitating the establishment of energy-intensive industries along the western coast of Norway. Unlike other regions in the world that heavily relied on coal and oil during the industrial revolution, Norway had the advantage of harnessing clean and renewable energy sources for its industrial advancements.[58]

Therefore, as in the Swedish case, the motivating drivers of the energy transition to hydropower have no direct relationship with environmental interests. However, these large-scale hydropower producers must adapt their production to the current EU environmental and energy policies. Consequently, the two countries provide together to a special case study. Since their conditions are quite similar, it will be enlightening to understand what the challenges are while these two countries seek to build synergy between environmental oriented commitments and economic development goals.

In Norway, like Sweden, there are proponents of hydropower development[59], including the Norwegian Water Resources and Energy Directorate (NVE), which is responsible for managing Norway's water and energy resources.[60] Advocates for hydropower in Norway argue that its development brings about substantial economic benefits, opportunities for job creation, and the potential to achieve renewable energy targets while reducing greenhouse gas emissions. The NVE's position reflects the belief that hydropower can play a significant role in Norway's energy sector and contribute to its broader sustainability objectives.[61]

[58] Ministry of Petroleum and Energy, The History of Norwegian Hydropower in 5 Minutes, 2016. https://www.regjeringen.no/en/topics/energy/renewable-energy/the-history-of-norwegian-hydropower-in-5-minutes/id2346106/

[59] Energy companies such as Statkraft, Norsk Hydro, and E-CO Energi, are also hydropower advocates.

[60] About NVE https://www.nve.no/about-nve/

[61] About NVE https://www.nve.no/about-nve/

### 2.2.2 *Aligning Norway's Hydropower with EU Environmental Policies: Shortcomings and Opportunities*

Unlike Sweden, in Norway, the implementation of EU environmental policies is based on the country's commitments under the EEA Agreement. The EEA Agreement has extended the application of EU environmental policy through the European Economic Area (EEA).[62] Consequently, Norway is required to incorporate directives such as the WFD and the RED. The RED imposed an obligation on Norway to raise its proportion of renewable energy consumption from 60.1% in 2005 to 67.5% by 2020.[63] However, the Norwegian government did not view the Directive favorably due to the limited potential for greenhouse gas (GHG) reduction in the country's electricity sector, which was already heavily reliant on hydropower.[64] Nevertheless, Norway has demonstrated remarkable compliance with the objective of increasing the share of renewable energy in its gross final energy consumption by 2020, achieving the mark of 77.4% in renewable energy in gross final consumption.[65]

Just as the environmental interests can be conflicting, EU policies are also sending conflicting messages at times. While hydropower is the main factor for Norwegian overachievement of the RED goals, production of this renewable form of energy is the main stressor for aquatic environments in Norway, posing "severe threats to biodiversity, fish stocks and flora". This makes the achievement of a holistic ecosystem approach implausible. Thus, implementation of the RED and WFD in Norway constitute a dichotomy between hydropower impact on achievement of good water status and the successful promotion of renewable energy production, also in the Norwegian context. Once again, the question rises of whether the EU provide a pathway for countries to reconcile these two divergent policies or if the countries are left with too little guidance to find the path to harmonize the two interests on their own.

### 2.2.3 *Reconciling Conflicting Policies: The Need for Guidance in Norway's Energy Transition*

Just as environmental interests can sometimes be conflicting and, EU policies themselves also send conflicting messages, as established so far. While hydropower plays a central role in

[62] Vogler, 2011, p. 19.
[63] Rosendal et al., 2019, p. 524. Rosendal refers to official information from the Norwegian Ministry of Petroleum and Energy.
[64] Ibid.
[65] EUROSTAT, EU Overachieves 2020 renewable energy target. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220119-1

Norway's remarkable overachievement of the RED goals, its production, as a renewable energy source, poses significant stress on aquatic environments in the country. This situation leads to "severe threats to biodiversity, fish stocks, and flora," [66] making it challenging to achieve a holistic ecosystem approach.

As a result, the implementation of the RED and the WFD in Norway also presents a dichotomy between the impact of hydropower on achieving good water status and the successful promotion of renewable energy production. Thus, the next subchapter will delve into possible pathways provided by the EU for countries to reconcile these two divergent policies. The intension of the further subchapter is to determine if countries are left with insufficient guidance to harmonize these competing interests on their own.

## 2.3 WFD and RED: EU Guidelines on Hydropower and Environmental Conservation.

### *2.3.1 WFD Safeguarding EU Water Bodies and RED Promoting Renewable Energy*

The WFD has played a pivotal role in safeguarding European water bodies.[67] To effectively implement the WFD, Member States are required to undertake several key actions. These include establishing River Basin Districts (RBDs) and assigning competent administrative authorities for each RBD. Additionally, Member States must develop River Basin Management Plans (RBMPs) that encompass the Programme of Measures (PoM)[68] to be implemented within each RBD.[69]

In cases where a river basin has transboundary aspects, cooperative efforts among Member States as well as cooperation with non-EU Member States must be sought to implement a single RBMP and effectively implement the PoM throughout the entire RBD.[70] Furthermore, Member States are responsible for identifying and assessing the stressors and economic impacts, such as hydropower production, within the RBDs.[71]

Different from natural water bodies, for heavily modified water bodies (HMWB) or artificial water body (AWB) Member States must seek the "good ecological potential" (GEP)[72]. The

[66] Hanssen, et al., 2016, p. 3.
[67] COM, Water Framework Directive, https://environment.ec.europa.eu/topics/water/water-framework-directive_en
[68] Article 4.1 of the WFD.
[69] Article 11.1 of the WFD.
[70] Article 13.1 to 3 of the WFD.
[71] Article 5 of the WFD.
[72] COM (2003), Common Implementation Strategy (CIS), p. 11.

regulatory structure of hydropower operations is mainly affected by the environmental objectives for HMWB, as Member States are obligated to design a program of measures (PoM) to protect and enhance all HMWB, aiming to achieve GEP. Among these measures, the issue of licenses is significant.

In fact, it is an obligation for the Member States to identify and classify HMWB pursuant to Art. 4.3 of the WFD. Such a classification can be made when the social benefits provided by the HMWB cannot be achieved by a more appropriate environmental option, either due to lack of technical resources or economic challenges.[73] This means that, in principle, Member States are entitled to remove the prohibition potential threats to operation carried out in HMWB.

In fact, the CJEU clarified in C-346/14 Commission v Austria ('*Schwarze Sulm* case')[74] that regarding the derogation regime of Article 4(7) of the WFD, a "complete harmonisation"[75] of water rules throughout the Union is not the objective of the WFD. The CJEU states that Member States shall rather be allowed a certain margin of discretion for defining whether[76] a hydropower project, for instance, is of overriding public interest.

On the other hand, aligned with the aspiration to advance renewable energy sources, the EU has assumed a pivotal role in facilitating the energy transition across the Union while aspiring to move the needle towards energy transition worldwide. Thus, introduced in 2009, the RED was specifically formulated to promote energy from renewable sources[77], including wind, solar and hydropower, among others. Member States are empowered to establish support schemes for electricity generated from renewable sources in compliance with RED, thus effectively encouraging the production of hydropower.

Crucially, RED establishes a binding target for renewable energy of no less than 32% by 2030.[78] Notably, the EU Commission, in the first semester of 2023, has provisionally endorsed an increased binding target of 42.5%[79] for renewable energy by 2030, with an ultimate

[73] Article 4.3 b of the WFD.
[74] Case C-346/14 European Commission v Republic of Austria (2016) ('Schwarze Sulm') ECR I-322. (Hereinafter the *Commission v Austria*)
[75] Ibid, paragraph 70.
[76] Ibid.
[77] Article 1 of the RED.
[78] Article 3 (1) of the RED.
[79] COM, Renewable Energy Targets. https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en

aspiration of attaining 45%.[80] Nonetheless, the formal adoption of this legislation is prerequisite before Member States are bound by the 45% target. In the year 2021, hydropower accounted for 32.1% of electricity generated from renewable sources within the EU.[81] Consequently, it is evident that the realization of the 2030 target would be unattainable without the substantial contribution of hydropower.

Since the Integrated National Energy and Climate Plans (NECPs) outline how EU countries intend to tackle decarbonization, energy efficiency, and energy security, among other things, they are also pertinent for reviewing Member States' energy policies. The NECPs were introduced by the Regulation on the Governance of the Energy Union and Climate Action (EU) 2018/1999, which was adopted in 2019 as part of the Clean Energy for All Europeans package. As part of the 2020 Energy Union report, the Commission published individual assessments of each national plan to provide further guidance.[82]

### *2.3.2 The Conflicting within Objectives: Reconciling Hydropower Development and Biodiversity Conservation*

Against this backdrop, although the construction and expansion of large-scale hydropower plants are in direct conflict with the environmental objectives outlined in Article 4.1 (a) of the WFD, a derogation regime is established in Article 4.7 of the WFD. To apply the derogation strict conditions must be met including the absence of significantly better environmental options, the demonstration that the benefits of the new infrastructure outweigh the benefits of achieving the environmental objectives of the WFD, and the implementation of all practicable mitigation measures to address any adverse impact on the water body's status.[83] Member States face a challenging task in making the fundamental decision between these two conflicting interests, as biodiversity conservation can hold invaluable potential while simultaneously lacking feasible alternative environmental options for climate mitigation.

[80] COM, Renewable Energy Directive Targets and Rules https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en
[81] IEA (2022) Renewables, Renewable electricity, Solar PV claims the most installed power capacity worldwide by 2027, surpassing coal, natural gas and hydropower.
[82] COM, National energy and climate plans, EU countries' 10-year national energy and climate plans for 2021-2030. https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en
[83] Kampa, 2022, p. 4.

In light of these considerations, the following subsection will delve into the EU non-binding guidance document on the requirements for hydropower in relation to EU Nature legislation.[84] It is important to note, however, that this document primarily provides guidance on how hydropower can be operated in accordance with the requirements of the Nature Directives[85]. While the WFD plays a secondary role in the EU guideline, it is still the EU document that comes closer to shed light on how to reconcile the conflicting interests arising from the WFD and the development of hydropower.

## 2.4 EU Non-binding Guidance for Hydropower Policy Conflict.

### *2.4.1 Mitigating Hydropower Pressure: Introducing Good Practices for Hydropower and Aquatic Ecosystems*

Upon initial examination, the EU guidelines appear to provide limited guidance on the methods that Member States should employ to reconcile these conflicting objectives discussed in this thesis. However, there is one notable exception: the non-binding guidance document on requirements for hydropower in relation to EU Nature legislation, which was published in 2018, nearly a decade after the enactment of the RED in 2009. This document aims to introduce a range of good practices for mitigating and restoring the impacts caused by hydropower on aquatic ecosystems in Member States. It also presents various measures to address the impacts resulting from hydro-morphological alterations and suggests actions for restoring the ecological status of affected areas.[86] Illustrative examples provided by the document include the restoration of river continuity and the use of adapted turbines to reduce fish mortality.

Nonetheless, the EU Commission acknowledges the persistent challenge of reconciling the objectives of the WFD with the requirement to generate renewable energy, as demonstrated in the analysis of the Mur River case in Austria.[87] In addressing this challenge, the Commission highlights the importance of adopting a strategic and integrated planning approach, which can be effectively implemented through the National Renewable Action Plans (NRAP), RBMP, and the conservation objectives of Natura 2000 sites, as outlined in the guideline.[88] Such

[84] COM (2018). Guidance on the Requirements for Hydropower in Relation to EU Nature Legislation.
[85] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206 22.7.1992, p. 7) hereinafter the Habitats Directive and the Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version) (OJ L 020 26.1.2010, p. 7) hereinafter the Birds Directive.
[86] COM (2018), Guidance on the Requirements for Hydropower in Relation to EU Nature Legislation, p. 35.
[87] Ibid, p. 45.
[88] Ibid, p. 51.

integrated implementation would than provide for comprehensive mitigation of hydropower pressure on water bodies.

### *2.4.2 A Possible Solution: Strategic Integrated Planning Process*

According to the guideline, a strategic planning approach offers several advantages. Firstly, it provides a platform within RBMP to seamlessly integrate strategic planning for hydropower development with water environment objectives.[89] This integration allows for the harmonization of water, nature, and energy policy objectives, as well as the alignment with objectives from other significant policy domains.

Furthermore, such an approach enables the linkage of strategic planning for the aquatic environment and nature conservation with national energy planning specifically focused on the production of renewable electricity.[90] This intersectionality allows for a coordinated and synergistic approach, ensuring that the objectives of all involved sectors are effectively addressed and mutually reinforcing.

The guideline emphasizes that while such an integrated planning process may necessitate a more substantial initial investment for the relevant public authorities, the evidence unequivocally indicates that it can produce substantial benefits in the long run for all stakeholders involved, including the energy sector and the WFD. These benefits often surpass the initial additional investment required, underscoring the significance of adopting an integrated planning approach that considers both renewable energy production and environmental conservation objectives.[91]

The proposed approach entails the formulation of a comprehensive and integrated strategic planning framework, particularly in the context of identifying optimal sites for hydropower generation that align with both energy and environmental considerations. Simultaneously, this strategic integrated planning process aids in pinpointing areas with a heightened probability of significant environmental impacts, subsequently reducing the likelihood of obtaining permits under the exemptions outlined in Article 4.7 of the WFD.[92]

[89] Ibid.
[90] Ibid.
[91] Ibid, p. 52.
[92] Ibid.

In conclusion, the key EU recommendation to reconcile hydropower with protection of aquatic ecosystems is the adoption of strategic planning approach which should be linked to the renewable energy action plan and the RBMP. Which would lead to a national comprehensive and integrated strategic planning framework.

*2.4.3 The CJEU*

The decisions of the Court of Justice of the European Union (CJEU) serve as illustrative examples of how the derogation regime outlined in Article 4.7 should be implemented. The guideline incorporates relevant case law[93], including judgments in case C-461/13 (*The Weser Case*)[94] and C-346/14 (*Commission v Austria*)[95] which provide guidance on the interpretation and application of the derogation regime set forth in Article 4.7. In the Austrian river case, despite the adverse impact of a hydropower plant on the surface water's "high" status, the conditions for derogation from the prohibition were deemed to be satisfied.[96] As a result, the CJEU ruled that the Member State should be afforded a certain margin of discretion in determining whether the hydropower operation constitutes an overriding public interest.[97]

Furthermore, the promotion of renewable energy sources is a paramount priority for the EU due to their significant contributions to environmental protection, sustainable development, energy security, and energy diversity.[98] It is worth noting that in this particular case, the national decision challenged by the Commission dates back to 2007, predating the enactment of the RED. The interpretation derived from this case sheds light on the correlation between international climate commitments[99], enacted by the EU RED, and hydroelectric power production, leading to the conclusion that Member States are permitted to take these commitments into account when invoking the derogation under Art. 4.7 of the WFD.

[93] Ibid, p. 12.
[94] Case C-461/13 German Federation for the Environment and the Conservation of Nature v Federal Republic of Germany (2015) ECR I-433 (Hereinafter *Weser Case*).'
[95] *Commission v Austria*.
[96] Ibid, paragraph 68.
[97] Ibid, paragraph 70.
[98] Ibid, paragraph 73.
[99] Ibid.

### *2.4.4 Best Practices: Looking to Member States Sound Solutions.*

Among the examples provided in the guideline involves the removal of barriers, classified as significant pressures, from the Danube RBD to tackle the river and habitat continuity interruptions.[100]

Furthermore, the guideline highlights Germany's remaining exploitable potential for hydropower, which primarily involves small, previously undeveloped, and undisturbed water bodies. The European Commission acknowledges that the cost-benefit analysis becomes less favorable when the installation capacity is smaller, and a more natural watercourse is used.[101] Economic considerations reveal that subsidizing the operating costs of small hydropower plants results in high macro-economic costs to mitigate CO2 emissions. Given the negative ecological impacts, further exploitation of the potential of small hydroelectric power plants is not a priority in terms of climate protection.[102]

Another example discussed in the guideline is the Kembs project that comprises the environmental integration of a large existing hydropower scheme, France. Since the Kembs project spans three countries with differing views on environmental management, Electricity de France chose an integrated approach to achieve environmental improvements rather than seeking a strict balance between impact and mitigation. This integrated project successfully enhanced the environmental quality of the hydropower complex, despite the energy losses resulting from the increased ecological flow (partially compensated by the new plant).[103]

### *2.4.5 Harmonizing Policy Objectives*

In conclusion, the non-binding guidance document on requirements for hydropower supported by the decisions of the CJEU provide some solutions for hydropower operation in accordance with the RED and the WFD. The non-binding guidance offers good practices for mitigating the impacts on aquatic ecosystems and suggests measures to restore affected areas. The CJEU decisions, shed light on the interpretation and application of derogation under Article 4.7 of the WFD in relation to the development of hydropower operation. Furthermore, the guideline

[100] COM (2018). Guidance document on the requirements for hydropower in relation to EU Nature legislation, p. 24.
[101] Ibid, p. 29.
[102] Ibid.
[103] Ibid, p. 46.

highlights the significance of adopting a strategic and integrated planning approach that harmonizes water, nature, and energy policy objectives.

This chapter explored the challenges faced by Norway and Sweden in reconciling their hydropower development with EU environmental policies. It highlights the historical development and industrial advancements of hydropower in the two Nordic countries, which has played a significant role in its energy sector and sustainability objectives. The chapter discussed the shortcomings and opportunities in aligning Nordic hydropower with EU environmental policies, particularly the WFD and the RED. It emphasizes conflicting interests arising from the impact of hydropower, which pose challenges in achieving good water status and promoting renewable energy production, raising questions about the guidance provided by the EU to harmonize these divergent policies. The chapter also examines the EU's non-binding guidance for conflicts in hydropower policy, emphasizing the importance of strategic integrated planning to mitigate the pressure of hydropower on water bodies while considering both energy and environmental objectives. It cites CJEU decisions and best practices from Member States as examples to inform the implementation of the derogation regime outlined in the WFD.

# 3 HYDROPOWER: THE SWEDISH APPROACH.

In Sweden, the authorities responsible for the implementation of the WFD are the Water Authorities (*Vattenmyndigheterna)*.[104] is entrusted to the Water Authorities (Vattenmyndigheterna). The Environmental Protection Agency (Naturvårdsverket) plays a pivotal role in evaluating the environmental impact of hydropower projects. The agency formulates strategies for environmental requirements and oversees adherence to environmental regulations. Additionally, the Water Authorities (Vattenmyndigheterna) are responsible for executing the EU WFD in Sweden. They strive to achieve favorable water status and sustainable water management, encompassing considerations for hydropower operations and their effects on water bodies. The County Administrative Boards (Länsstyrelserna) are integral to the permitting process for hydropower projects, encompassing environmental impact assessments and ensuring regulatory compliance.

[104] Water Authorities About the water authorities https://www.vattenmyndigheterna.se/other-languages/english.html

## 3.1 Implementation of WFD in Sweden: Environmental Objectives

In Sweden, the WFD was transposed through Section 5 of the SEC, the Water Management Regulation and regulations from the Maritime and Water Authority.[105] The objective was to achieve good ecological status for the covered water bodies by 2015 or, in exceptional cases, by 2021 or 2027. A fundamental principle is to prevent the deterioration of water body status or potential.

For water bodies designated as protected areas, such as Natura 2000 sites, the water authority is responsible for establishing environmental quality standards (EQS) to ensure compliance with Natura 2000 legislation. This includes meeting the requirement for favorable conservation status. If a water body is subject to different quality requirements, the stricter requirement specified in Chapter 4, Section 7 of the Water Management Ordinance shall apply.[106]

For instance, prior to the de facto halt of hydropower development in Sweden, production of this form of energy was facilitated through water laws. The regulatory framework, often referred to as "permissibility rules," prioritized the economic aspects of development over environmental protection.[107] As a result, the terms and requirements of licenses issued during the hydropower expansion period reflect this approach.

### *3.1.1 GEP in HMBW*

Although water bodies are modified for the most various purposes, in Sweden, hydropower is the leading drive for which rivers and lakes are designated as HMBW.[108] The latter are defined in Article 2.9 of the WFD as surface water body substantially altered by anthropogenic operations and it is the Member States responsibility to designate the HMBW, pursuant to the provisions of the WFD.

In Sweden, the Water Authorities is responsible to investigate whether the physical characteristics of the water body have been significantly altered due to human activities. This investigation includes assessing the quality factors of the hydrological regime and

[105] Havs- och vattenmyndigheten, Energimyndigheten och Svenska kraftnät Förslag till nationell plan för omprövning av vattenkraft Med beskrivning av vattenmiljö och effektiv tillgång till vattenkraftsel samt identifierade behov för fortsatt arbete, 2019, hereinafter National Plan for the Revision of the Hydropower Plant Licenses, p. 30. (Translated by the author)
[106] National Plan for the Revision of the Hydropower Plant Licenses, p. 31.
[107] Michanek and Zetterberg, 2017, p. 344.
[108] COM (2019), Member State: Sweden, Report on the implementation of the WFD, p.111.

morphological condition. Additionally, the Water Authorities evaluate the likelihood of the water body achieving good ecological status despite the altered physical environment.[109]

In the next step, the necessary measures to achieve good ecological status are identified. It is then analyzed whether implementing these measures may have a significant negative impact on the benefits derived from the activities. Crucially, the assessment considers whether the environmental measures are likely to significantly affect the societal benefits provided by the activities. If the assessment indicates that the environmental measures could be implemented without a significant negative impact on the societal benefits, the water body should not be designated as HMBW. Moreover, all the criteria from the previous steps must be met for a water body to be declared HMBW.[110]

Achieving this standard set in EU policy means that Swedish authorities had to implement national policies that sought to classify water status as well as attain GEP of the HMBW. In fact, the WFD classifies GEP achieved in a HMBW when the values of relevant quality elements are slightly modified in comparison with the values found in MEP. That means, for instance, the hydro morphological conditions foster an environment that allows for the attainment of a GEP.[111] According to the European Commission guidance document, maximum ecological potential (MEP) is the benchmark on which the water status classification for HMWB and AWB shall be based.[112]

### *3.1.2 Derogation Regime of Article 4.7 and the EQS*

A shortcoming in the Swedish implementation of the WFD is the inappropriate transposition of the crucial derogation regime stated in Article 4.7 of the directive, rendering it ineffective in individual processes. As a result, court rulings in Sweden have raised concerns from an EU legal standpoint, as the courts seem to have struggled to ensure fairness for applicants and permit holders, failing to uphold the non-deterioration requirement and the intended derogation regime.[113] The European Commission has formally pointed out that Sweden's implementation

[109] Swedish Water Authorities, Heavily modified water body, https://www.vattenmyndigheterna.se/vattenforvaltning/miljokvalitetsnormer-for-vatten/kraftigt-modifierad-vattenforekomst.html Last accessed in 22/05/2023.
[110] Swedish Water Authorities, Heavily modified water body, https://www.vattenmyndigheterna.se/vattenforvaltning/miljokvalitetsnormer-for-vatten/kraftigt-modifierad-vattenforekomst.html Last accessed in 22/05/2023.
[111] Annex V, 1.2.5 of the WFD.
[112] COM (2003), CIS, p. 53.
[113] Söderasp and Pettersson, 2019, p. 266.

of the derogation regime lacks clarity and enforceability.[114] This is mainly due to the regime being completely detached from the individual licensing process, preventing its application by licensing authorities, even in cases where projects cause deterioration or jeopardize achieving good water status or potential.[115]

EQS refer to the concentration of specific pollutants or groups of pollutants in water, sediment, or biota that should not be exceeded to protect human health and the environment.[116] Among the shortcomings of Swedish transposition of the WFD's environmental objectives is the ambiguous legal status of the Swedish EQSs, which caused difficulties in interpretation. The legislator implemented Article 4 of the WFD through different categories of EQSs under Chapter 5 of the SEC.Yet, only the EQSs for surface waters' and HMWB's chemical status were categorized as limit values, which may not be exceed, and were as such legally binding under Swedish law.[117] EQSs for ecological status or potential were generally transposed lacking the legal status.[118]

From the ruling on the *Weser* case, however, the CJEU provided that all the environmental objectives are legally binding and the compliance with these objectives to be ascertained in each individual case.[119] This clarification has raised doubts regarding the capability of Swedish legislation to correctly transpose the WFD. Against this backdrop, the SEC was emended so that Chapter 24, section 10 of the SEC, since 2019, states that provisions and conditions which indicates that the operation is "significantly hampered" may be decided if necessary to comply with an EQS or with Sweden's commitment to the EU.[120] However, from Söderasp's analysis of the Swedish case law, the Swedish legislation insufficiently altered in its substantive or procedural rules to entirely implement a new and modern environmental requirement in the Swedish water law framework.[121] This way, Swedish courts have had leeway to authorize projects to extend hydropower operation without review of the entire operation.[122]

[114] Ibid, p. 277.
[115] Ibid.
[116] Article 2 (35) of the WFD.
[117] Söderasp and Pettersson, p. 276 and 277.
[118] Ibid, p. 277.
[119] *Weser* case (50) and (51).
[120] Söderasp and Pettersson, 2019, p. 274.
[121] Ibid, p. 290.
[122] Ibid, p. 274.

Söderasp's investigation also reveals inertia in the interpretation and application of WFD environmental objectives by Swedish courts. Traditional values like stability and legal certainty have outweighed flexibility and environmental protection. This is evident in cases involving outdated permits and rulings prior to licensing processes, disregarding the adaptive water governance system of the WFD. Examples include the Långforsen I case, where the assessment ignored the current state of the environment, and the Näckån, Lasele, and Långbjörn cases, where obligations to prevent deterioration were interpreted dubiously. These decisions do not fully comply with EU law, as established in *Weser* and *Commission v Austria* cases.

### *3.1.3 National Plan for the Revision of the Hydropower Plant Licenses*

Regarding the modern environmental requirement, new legislation was introduced aiming to clarify the Swedish implementation of the EU directive. In 2017, the Swedish government amended Chapter 11 of the SEC, where water activities and hydropower are addressed. With the heading *Moderna miljövillkor* or modern environmental requirements (MER) the new section of the SEC lays upon the operator the obligation to achieve the MER.[123] To comply with the MER, water activities, such as hydropower plant operations, shall hold a permit in line with the requirements for environmental and human health protection pursuant to the SEC, or to a decision no older than forty years.[124] However, once the operator has applied for a permit or review of existing permit to align the operation with MER, it the activity can be carried out during the entire assessment process.

"In Sweden, according to a new national plan, all existing hydropower licenses will be reviewed over the next 20 years. This will involve placing greater emphasis on mitigation of impacts, including setting minimum environmental flows and the instal- lation of fishpasses."

Considering that large majority of hydropower concessions operating in Sweden had been granted before the introduction of the MER, the Swedish Government adopted the National Plan for the Revision of the Hydropower Plant Licenses (NAP) in 2020. This plan allows for the review hydropower plants licenses over a period of approximately 20 years. Unlimited concessions will no longer be issued and the limit for new concessions will be 40 years. "This will involve placing greater emphasis on mitigation of impacts, including setting minimum

[123] Chapter 11, Section 27 SEC enacted by ordinance 2018:1407. (Translated by the author)
[124] Ibid.

environmental flows and the installation of fishpasses."[125] The objective of the revision process is to ensure that hydropower operations comply with the MER,[126] while maximizing hydroelectricity production capacity. The responsibility to assessing license review, in Sweden, lies with the Land and Environment Courts.[127]

During the re-examination of water activities' licenses, the court will determine whether the operations meet the conditions to achieving the maximum possible benefit for the aquatic environment and ensure effective national access to hydroelectricity.[128] Hydropower license revision aims to bring the Swedish centennial hydropower system in line with the requirements of the WFD. However, this process may potentially lead to a decrease in hydropower production, which could impact climate goals. Swedish authorities should address and balance this issue during the reassessment of hydropower licenses. The NAP applies to water activities aim for hydropower production, such as water regulation, water diversion, water transfer or any other activity that influence on the flow of water with the purpose of generating electricity.[129] In light of the analysis presented by Söderasp, it becomes apparent that the Swedish courts have not fully adhered to the environmental objectives of the WFD, as mentioned in subsection (3.2.2) above.

The NAP also highlights that the EU Commission has determined that Swedish legislation does not fulfill the objectives stated in Article 4.1 of the WFD concerning the updating and re-examination of permits.[130] This means that projects that are incompatible with the environmental goals outlined in Article 4.1 are not adequately addressed. Therefore, the NAP aims to provide an explanation for the Swedish implementation of the WFD. The explanation begins by recognizing the significant role that hydropower plays in Sweden's renewable electricity supply and the importance of achieving high hydropower production to increase the share of electricity from renewable energy sources.[131] This forms the basis for the approach taken by the NAP, which places a strong emphasis on hydropower production and ensuring the security of Sweden's national energy supply.

[125] Kampa, 2022, p. 9.
[126] National Plan for the Revision of the Hydropower Plant Licenses, p.60.
[127] Ibid, p.10. *"The courts that will handle trials for modern environmental conditions are the five land and environmental courts at Nacka, Umeå, Vänersborg, Växjö and Östersund district courts."*
[128] Ibid, p.1.
[129] Chapter 11 § 6 of the SEC.
[130] National Plan for the Revision of the Hydropower Plant Licenses p. 1.
[131] Ibid.

### *3.1.4 RBDs' Organization in Sweden*

To achieve the objectives outlined in Art. 3 of the WFD, Sweden has established five RBDs through Section 5, §13 of the SEC. Among these RBDs, three are international RBDs shared with Norway and/or Finland.[132] The responsibility for each RBD has been assigned to regional Administrative Boards by the Swedish government. These Administrative Boards are composed of a specific group of bureaucrats known as the RBD Authorities, who handle the day-to-day tasks related to the RBDs. They possess decision-making authority regarding environmental objectives and are tasked with managing the quality of the aquatic environment.[133]

Each RBD is managed by a team of approximately 8-10 bureaucrats who oversee the implementation of key activities outlined in the WFD. As in Norway, separate structures have been established within each RBD, in Sweden.[134] This includes the water delegation, a special water district board, which holds decision-making authority on environmental objectives, RBMP, and PoM. The water delegation consists of expert members appointed by the government for a fixed term. [135]

Collaboration with international stakeholders is also a crucial aspect of the RBDs' responsibilities. To facilitate joint management of shared water bodies, Sweden and Norway have established a collaborative effort aimed at harmonizing actions and programs, improving water conditions, and implementing a unified classification method.[136] This approach ensures a holistic management approach to the RBDs, avoiding fragmented measures that could lead to conflicts during the classification of water bodies.

### *3.1.6 PoM*

In the Swedish legal system, the PoM holds legal biding status under Chapter 5 of the SEC. The PoMs are directed towards central authorities, county administrative boards, specific regions, and municipalities, which are tasked with ensuring compliance with EQS through

[132] Swedish Water Authorities https://www.vattenmyndigheterna.se/vattendistrikt.html. (Translated by the author)
[133] Indset, 2023, p. 276 & 277.
[134] Ibid.
[135] Swedish Water Agency, About the water authorities https://www.vattenmyndigheterna.se/other-languages/english.html. (Translated by the author)
[136] Swedish Water Agency, Internationell samverkan. https://www.vattenmyndigheterna.se/vattendistrikt/bottenviken/internationell-samverkan.html. (Translated by the author)

various administrative policy measures, such as supervision, assessment, guidance initiatives, and preventive actions.[137]

Article 11.3 of the WFD establishes basic measures, which constitute the minimum requirement for Member States' PoM. Sweden implemented measures to comply with Article 11.3. For instance, Sweden implemented improvement of longitudinal continuity through the establishment of fish passes and demolishing old dams is planned for all five RBDs together, by projecting a reduction of barriers from 6,886 in 2018 to 689 in 2021.[138] This would lead to correction of the loss of hydrologic connectivity in lotic ecosystems caused by fragmentation. Therefore, enabling, among other things, restoration of river flows and nutrient exchange.

Among the key types of measures designed by Sweden is the "improvement in flow regime and/or establishment of ecological flows". In relation to flow regime, all Swedish RBDs reported pressure to surface water due to hydropower development. Thus, several water bodies, where ecological flows have to be established to achieve objectives is used for measuring the progress related to this measure. However, an increase of water bodies under this impact is expected for 2018 to 2021.[139]

### *3.1.5 EU Assessment of the Swedish implementation of the WFD*

According to the environmental objectives spelled in Article 4.2 of the WFD, RBMP are the tools that Member States should utilize to operationalize measures and programs for the protection and improvement of the status of HMBW in order to achieve the GEP. With regard Regarding to Sweden's second RBM, the Commission Staff Working Document recommended the implementation and reporting of actions aimed at addressing all hydro-morphological pressures, which should include restoration of the hydrological and hydro-morphological conditions of water bodies."[140]

Restoring hydrological and hydro-morphological conditions would potentially involve decommissioning hydropower installation. Although measures are undertaken to decommissioning small hydropower plants with disproportional environmental impact in comparison to the renewable energy produced, this is not the main objective. Thus the EFD

[137] Water Authorities, Action program for water in the North Sea Water district 2022–2027, "Åtgärdsprogram för vatten 2022—2027 Norra Östersjöns vattendistrikt", p.10.
[138] COM, (2021) Assessment of progress in PoMs Member State: Sweden, p. 21
[139] Ibid.
[140] COM (2019), Member State: Sweden, Report on the implementation of the WFD, p. 24.

provide for the derogation regime outlined in Art. 4.7 of the WFD. This provision allows Member States to make exemptions aiming to achieve less stringent environmental objectives than those required under Article 4.1 for HMBW or in situations where achieving these objectives would be infeasible or disproportionately expensive. In the Commission's assessment of the Swedish RBMP, it was noted that Sweden has made progress in fulfilling EU recommendations. For example, Sweden has successfully addressed the recommendation to identify the pressures and assess the status of water bodies where there were high uncertainties in the characterization of the RBDs before the second cycle.[141] This information is crucial in determining the plans and measures to be undertaken to meet the environmental objectives.

In contrast, the Commission recommended the inclusion of clear obligation in the RBMPs to prioritize measures and the review of hydropower operation licenses. The recommendation was made because the Swedish first PoM did not specify hydro-morphological measures, despite numerous water bodies being affected by this kind of pressure. Furthermore, it was emphasized that a clear link should be established between to protect biological quality elements.[142] In Sweden's report, the number of water bodies requiring hydro-morphological measures to achieve GEP was omitted, although the number of water bodies affected by significant hydro-morphological pressures has been reported. [143] In fact, the data provided refers to the five main RBD where ecological flows are needed to attain targets for hydropower.

Additionally, Sweden does not indicate a systematic revision of permits to address hydro-morphological problems. Although the Swedish NAP, enacted in June 2020, aimed to establish a framework for license review, the Swedish authorities announced a 12-month pause in the re-examination of environmental permits for hydropower plants.[144] As a result, new applications that were originally scheduled for submission on February 1, 2023, will now be submitted on February 1, 2024.[145] However, ongoing cases will continue as planned. Consequently, new review of hydropower operation licenses will not be carried out during the course of 2023.

[141] Ibid, p. 46.
[142] Ibid, p. 151.
[143] Ibid.
[144] COM, (2021) Assessment of progress in PoMs Member State: Sweden, p. 7.
[145] Ibid.

## 3.2 Implementation of EU climate legislation and its impact on Swedish Energy Transition

To fulfill the objectives of the RED and promote renewable energy, Sweden has implemented quota system, carbon dioxide tax and a support scheme.[146] The Renewable Electricity Certificate System also known as Green Certificate[147], was introduced in 2003 and is considered "one of the most important tools for reaching Sweden's commitment towards the RED"[148]. Norway joined the Swedish Green Certificate scheme in 2012, and both countries share the goal of achieving 46.4 TWh of new renewable electricity production by 2030.[149]

### *3.2.1 Swedish Policies to Comply with RED*

The electricity production goals within the Swedish-Norwegian Green Certificate Scheme for 2020 and 2030 were reached in 2019. Sweden then raised its ambition to 18 TWh by 2030, resulting in an overall target of 46.4 TWh of new renewable electricity production by 2030. This target was also achieved, and in 2021, electricity certificates corresponding to 52.7 TWh were issued.[150] The significance of hydropower is clear: in Sweden, it accounts for approximately 40-45 percent of total electricity production. During the five-year period of 2016-2020, hydropower on average constituted 41 percent of the total electricity production.[151]

According to Chapter 1, Section 2 of the Act on Electricity Certificates hydropower constitute is one of the forms of renewable energy eligible for Green Certificates. However, specific requirements for electricity produced from hydropower are imposed in the Act on Electricity Certificates. Eligible facilities are those commissioned after the end of 2002, in operation on May 1, 2003, with an installed capacity not exceeding 1,500 KW.[152]

In the Swedish side of the scheme, producers of renewable energy receive a Green Certificate unit from the Swedish Government for each megawatt-hour (MWh) produced, which stimulates the production of the renewable electricity. Additionally, renewable energy

[146] LEGAL SOURCES ON RENEWABLE ENERGY Sweden: Overall Summary http://www.res-legal.eu/search-by-country/sweden/
[147] Banet, 2008, p. 212. "Green certificates aim at promoting the use of renewable energy sources and thus increasing the production of electricity based on renewable energy sources."
[148] SEI (2011), p. 4
[149] Chapter 1, Section 1 of (*Lag om elcertifikat)* the Swedish Act on Electricity Certificates (2011:1200)
[150] Prop. 2022/23:1 Expenditure area 21, p. 21. https://data.riksdagen.se/fil/28D34D6E-579A-4E8A-8842-D870FFD091B2
[151]Ibid, p. 11.
[152] Chapter 2, Section 5 of the Act on Electricity Certificates.

producers may trade the green certificates in the Swedish-Norwegian open market, generating extra revenue,[153] as energy suppliers, electricity consumers, and producers have quota obligation to hold and relinquish green certificates to the Swedish State in relation to the sale or use of electricity.[154] Thus, the Norwegian-Swedish Green Certificate market support the production of hydropower. Such an incentive brings to light the conflict between biodiversity and climate policies. In this regard, the Act on Electricity Certificates only a reference to permits in Chapter 11 of the SEC (see subchapter 3.1.3) as a requirement for hydropower eligibility to receive Green Certificates. It is established that pursuing the objectives of the RED sheds light on the conflict between climate and biodiversity goals since the production of renewable energy cannot be achieved without environmental impact.

In contrast to the promotion of hydropower through the Green Certificate scheme, Sweden has imposed stringent river protection measures since 1987, resulting in a de facto moratorium on new hydropower developments. Paradoxically, the Swedish Green Certificate Scheme, designed to fulfill the RED, grants subsidies for hydropower production plants.[155] The Swedish NECPs foresee an increase of around 1 TWh in hydropower capacity by 2025, primarily through the modernization and increased production capacity of existing installations,[156] aligning with the objectives of the RED.

While the promotion of hydropower contributes to utilizing energy from renewable sources, it also puts significant pressure on the Swedish ecosystem. The permit process that hydropower projects must undergo to ensure the optimal use of water bodies, in accordance with the WFD, acts as a hindrance to increasing hydropower capacity. The CJEU has established that Member States have discretion in deciding on the implementation of new hydropower operations when the derogation of Article 4.7 of the WFD applies.[157] However, Sweden initially transposed the WFD derogation regime in a way that made it unfeasible to be applied in individual processes, and the national courts have struggled to uphold the objectives of the WFD.[158]

[153] Swedish Energy Agency, The Swedish Electricity Certificate System. https://www.energimyndigheten.se/en/sustainability/the-electricity-certificate-system/
[154] Chapter 1, Sections 2 and 7 and Chapter 4, Section 1 of the Swedish Electricity Certificate Act.
[155] SEI (2011), p. 5.
[156] The Ministry of Infrastructure, Sweden's Integrated National Energy and Climate Plan, p. 119.
[157] *Commission v Austria*, paragraph 70.
[158] Söderasp and Pettersson, (2019), p. 290.

### *3.2.2 The Intersection between RED and Climate Policy Framework and Targets in Sweden*

A climate policy framework was adopted by Sweden in 2017, consisting of a climate targets, a climate act, and a climate policy council. The framework has a long-term objective, aiming to achieve net zero GHG emission by 2045.[159] This ambitious goal necessitates an increase in the production and consumption of renewable energy to meet the climate targets.

In line with this framework, Sweden enacted the Climate Act (2017:720), a concise piece of legislation containing general provisions. One notable provisions of the Swedish Climate Act states that the climate policy framework must be based on the long-term target established by the Riksdagen.[160] Additionally, the government is obligated to conduct the national climate policy in a manner that contributes to the protection of ecosystems and safeguards present and future generations against the harmful effects of climate change.[161] This places pressure on the authorities to balance climate goals with the protection of biodiversity interests.

The climate targets set by Riksdagen require a substantial reduction in territorial GHG emissions by 2030, with a long-term aim of at least 85% lower emission than in 1990, eventually leading to net zero emissions and even negative emissions by 2045. Furthermore, Riksdagen has adopted a sector target for domestic transport, mandating a minimum 70% reduction GHG emissions from domestic transport (excluding domestic flights) by 2030 compared to 2010 levels. As a result, the electrification of transport sector will also necessitate higher electricity production.

Overall, Sweden's climate policy framework and targets underscore the country's commitment to combatting climate change. The focus on increasing renewable energy production and reducing GHG emissions aligns with the overarching objective of achieving net zero emissions by 2045, while also considering the protection of ecosystems and biodiversity interests.

This Chapter discusses the implementation of the WFD in Sweden, focusing on environmental objectives. While the implementation included establishing EQS for protected areas and assessing the impact of measures on societal benefits, there were shortcomings in the transposition of the derogation regime and the legal status of EQSs. This resulted in ineffective

[159] Naturvårdverket, Sveriges klimatmål och klimatpolitiska ramverk https://www.naturvardsverket.se/amnesomraden/klimatomstallningen/sveriges-klimatarbete/sveriges-klimatmal-och-klimatpolitiska-ramverk/
[160] Section 3 of the Climate Act (2017:720).
[161] Ibid, Section 2

implementation and court rulings that did not uphold the non-deterioration requirement. To address these issues, Sweden introduced a NAP to review existing hydropower licenses and which align with the application of a strategic and integrated planning approach. The chapter also discusses the organization of RBDs in Sweden and the implementation of PoMs to achieve environmental objectives. Additionally, the chapter oversees the implementation of the RED, highlighting the role played by the Green Certificate scheme as a further illustration of the promotion of renewable energy impacting biodiversity interests.

In summary, the chapter highlights the challenges and efforts in implementing the WFD in Sweden, which will be further analyzed from the Portuguese perspective. The chapter discussed the transposition of the directive into national regulations, the shortcomings in the derogation regime and EQS implementation, and the introduction of the NAP to review hydropower licenses. It also explores the organization of RBDs and the implementation of PoMs to achieve environmental objectives. Overall, the chapter sheds light on the progress made and the areas that need improvement in Sweden's implementation of the WFD.

# 4 HYDROPOWER: THE NORWEGIAN ENERGY TRANSITION, AN OLD SOLLUTION TO RESULVE A KNEW CHALLENGE

As determined in Chapter 2 of this thesis, the EU has not provided countries with a comprehensive framework of methods to reconcile these conflicting environmental goals. Therefore, it is relevant to keep look into countries for best practices and shortcomings, since Norway also has to deal with conflicting environmental goals arising from EU directives.

## 4.1 Implementation of the WFD in Norway

The Norwegian legislator transposed the WFD into Norwegian law through the Water Regulation[162], enacted in May 2009. As a paramount producer of hydropower, Norway committed to achieving and maintaining “good status” for all bodies of water and aimed to achieve the goal of GEP for HMBW. In order to fulfill the obligations of Articles 3 and 4 of the WFD, Norway set up a total of eleven RBDs. Moreover, five international RBDs are shared with Sweden and/or Finland.[163]

[162] Water Regulation (Vannforskriften: Forskrift av 15. Desember 2006 nr. 1446 om rammer for vannforvaltningen.)
[163] Hanssen et al., 2016, p. 4.

In Norway, legislation regulating hydropower includes the Watercourse Regulation Act,[164] which establish rules for water regulations and/or transfers above a certain size.[165] However, these licenses are mostly approved without a limited timeframe. With a regulatory concession, several conditions are set, including environmental conditions. Hydropower development which does not come under the Watercourse Regulation Act are, generally, processed according to the Water Resources Act[166]. It is a general law to all types of measures in the watercourses.[167]

### *4.1.1 Derogation Regime of Article 4.7 WFD.*

In Norway, Article 4.7 of the WFD has been incorporated into Section 12 of the National Water Regulation. However, the RBMPs make limited reference to the derogation and there is a lack of comprehensive documentation regarding the appraisal required for derogation in the case permits and licenses are issued by sectoral authorities.[168]

Despite Norway's declaration of compliance with the WFD, a complaint lodged against Norway with the European Free Trade Association (EFTA) Surveillance Authority, which is responsible for examining the fulfilment of EEA policies. The complaint alleged that Norway was not adequately determining when a project should be considered under the derogation of Article 4.7. One of the points raised by the complainants was that the Section 12 of the Norwegian Water Regulation does not match the wording of the transposed provision.

The EFTA Surveillance Authority concurs that the term "overriding public interest", found in Article 4.7 (c) of the WFD, is not present in Section 12 of the Norwegian Water Regulation. However, the EFTA Authority recognizes that case law has established projects aiming to promote renewable energy sources, such as hydropower, may constitute an "overriding public interest" under Article 4.7(c) of the WFD.[169] The Authority, however, does not determine whether the absence pf the term "overriding public interest" in the Norwegian legislation has led to an issuance of licenses without the proper case-by-case assessments. It appears that the

[164] Act of 14 December 1917 no. 17 on watercourse regulations (*Vassdragsreguleringsloven*)
[165] Section 12 of the Water Regulation. https://energifaktanorge.no/en/regulation-of-the-energy-sector/det-juridiske-rammeverket/
[166] Act of 24 November 2000 no. 82 on watercourses and groundwater. (*Vannressursloven*)
[167] Norwegian Minister of Oil and Energy, Guidelines for revising the licensing of watercourse regulation, (*Retningslinjer for revisjon av konsesjonsvilkår for vassdrags- reguleringer*) 2012 p.8.
[168] EFTA Surveillance Authority, Case No: 69544, of March 2011, Inform from the Norwegian Hunters' and Anglers' Association, Friends of the Earth Norway, The Norwegian Trekking Association and WWF Norway, *Information regarding Norway's River Basin Management Plans and Programmes of Measures for 2016–2021*, p. 6.
[169] EFTA Surveillance Authority, Case No: 81034, of 7 September 2022, p. 14.

Authority believes it is the responsibility of the licensing authorities to analyze each case considering the concept of overriding public interest, even though it is not part of Section 12 of the Norwegian Water Regulation.

The complainants also challenged the ability of Norwegian legislation to ensure that licences granted to hydropower projects include "modern standard environmental terms".[170] The EFTA Surveillance Authority, however, concluded that it is not possible to determine a breach by Norwegian measures and legislation in this regard.

### *4.1.2 Hydropower Installations and the Norwegian Guidelines for the Revision of Concession Conditions for Watercourse Regulations.*

In Norway, The Ministry of Petroleum and Energy holds the responsibility for formulating energy policy and managing the energy system, which encompasses hydropower. Within Norwegian hydropower management, two significant tasks include granting licenses for new hydropower production and reviewing and updating the terms outlined in existing licenses, taking into account environmental factors.[171]

According to the WFD, Member States are required to review relevant permits and authorizations if the objectives set under Article 4 for a water body are unlikely to be achieved.[172] This applies specifically to water bodies extensively exploited for hydropower, where a license and permit review process must be implemented to ensure compliance with the environmental objectives of GEP.

Initially, Norwegian hydropower installation licenses were scheduled for revision after 50 years, but for plants built after 1992, the timeframe was reduced to 30 years.[173] In May 2012, the Ministry of Petroleum and Energy issued the Guidelines for the Revision of Concession Conditions for Watercourse Regulations. These guidelines identify 340 regulatory licenses with revision dates up to 2022. The primary aim of these guidelines is to modernize and update the license conditions, with a particular focus on environmental considerations.[174] This approach aligns with Sweden's approach, where the concept of modern environmental requirements is integrated into the license review process for watercourse regulations.

[170] Ibid, p. 11.
[171] Hanssena et al., 2016, p. 14 and 15.
[172] Article 11 (5) WFD.
[173] Guidelines for revising the licensing of watercourse regulation, 2012, p. 13.
[174] Ibid, p. 6.

Analyzing the situation, it can be observed that both Norway and Sweden recognize the importance of adapting hydropower licenses to meet modern environmental standards. By incorporating modern environmental requirements into the license review process, both countries align with the EU legislation and address environmental concerns to improve the environmental condition of HMWB.

To achieve the modernization of environmental requirements in Norway, standard conditions are introduced during the revision.[175] These standard conditions enable relevant authorities to impose mitigation measures as requirements for hydropower operators. The Norwegian Government recognized the need to review longstanding licenses to bring them in line with modern environmental requirements. Therefore, the Watercourse Regulation Act was amended, stating that all hydropower licenses can be reviewed after June 2022.

License terms revision (*konsesjonsvilkår*), as defined in Section 8 of the Water Regulation, involves modernizing or updating the license terms.[176] While water regulations and transfers are generally issued for an unrestricted period, environmental conditions(*miljøvilkår*) are set for water regulations and transfers concessions.[177] For installations using water bodies for energy production in Norway, compliance with environmental conditions is a requirement for the license. The license review process aims to modernize or update terms in outdated licenses, particularly in terms of environmental protection.[178]

Sweden has also used the term "modern environmental requirements" (*moderna miljövillkor*) for the reassessment of Swedish hydropower licenses. Specific rules for fulfilling modern environmental requirements are outlined in Chapter 11, Section 27 of the Swedish Environmental Code (SEC), which are applied during license reassessments.

The main purpose of revising license terms in Norway, according to the Norwegian Water Authority, is to improve the environmental condition of regulated waterways.[179] The revision process allows authorities to establish modern conditions to rectify environmental damage and

[175] Ibid, p. 25.
[176] Vannportalen, Tools and measures in water management DIRECTOR'S GROUP FOR IMPLEMENTATION OF THE WATER REGULATION (Virkemidler og tiltak i vannforvaltningen, DIREKTORATSGRUPPEN FOR GJENNOMFØRING AV VANNFORSKRIFTEN) 2019, p. 3.
[177] Guidelines for revising the licensing of watercourse regulation, 2012, p.8.
[178] Ibid, p.6.
[179] Tools and measures in water management DIRECTOR'S GROUP FOR IMPLEMENTATION OF THE WATER REGULATION 2019, p. 3.

issues resulting from water body regulation.[180] This is particularly important when the damage was not assessed during the initial license issuance or when environmental standards were less stringent.[181] Therefore, hydropower installations in Norway undergo an assessment to ensure compliance with modern environmental conditions concerning the impact on HMBW.

However, it is important to note that the target of the license revision is the conditions rather than the concession itself.[182] The Norwegian "Guidelines for revising the licensing of watercourse regulation" in Norway mention the cessation of conditions in a license but not the revocation of the license itself. This means that licenses are not revoked but rather modernized. In cases where hydropower operations pose risks or cause environmental damage, NVE/OED can still grant permission if the societal benefits of hydropower outweigh the disadvantages, and if renewable energy production cannot reasonably be achieved through significantly better environmental means.

Furthermore, in March 2011, the Association of Hydropower Municipalities, along with Norwegian nature protection organizations, jointly sent a letter of complaint to the EFTA Surveillance Authority (ESA). The letter addressed Norwegian national hydropower management practices and their compliance with the EU Water Framework Directive (WFD). It highlighted how the Ministry of Petroleum and Energy, as well as energy companies, used obligations under the EU Renewable Energy Directive as a justification for delaying the implementation of new license clauses concerning minimum water flow and ecological restrictions on hydropower reservoirs. These observed changes in hydropower licensing indicate a prioritization of renewable energy over nature protection, leading to a diminished emphasis on ecological principles in management.

### *4.1.3 RBD in Norway: RBMP and PoMs Management Framework*

In Appendix I of the Water Regulation, both the Norwegian and international RBDs are presented followed by the designated national RBD authorities. Section 18 of the Water Regulation stipulates that RBDs must establish measures and programs to monitor the state of water bodies. For Norwegian RBDs, monitoring programs for should include ecological

[180] Ibid.
[181] Ibid.
[182] Ibid.

potential, water flow, and/or water level, as relevant to ecological potential. These programs undergo reassessment every six years.

In Norway, the RBMP and the PoMs are developed for individual RBDs to outline specific environmental objectives for HMWB in accordance with Article 4 of the WFD.[183] The RBMPs and PoMs are drafted by the RBD-Boards,[184] which then propose them to the Regional Councils for adoption and final approval by the Ministry for Climate and Environment on behalf of the government."[185] Given that approximately 70% of Norwegian watercourses are used for hydropower production, hydropower is recognized as the most significant stressor to the aquatic environment in Norway,[186] emphasizing the need for PoMs tailored to address these activities.

### *4.1.4 Contrasting RBD Management Approaches in Norway and Sweden*

The Norwegian implementation of the WFD demonstrates a strong inclination towards the ecosystem-based management principle of RBDs.[187] Norway identifies eleven national RBDs and assigns five international RBDs, shared with Sweden or Finland.[188] Existing Councils are entrusted with RBD management in Norway, distinguishing it from the Swedish approach, which established five RBDs. In Sweden, the RBD Water Delegation, comprising 10 to 14 representatives, has more autonomy in determining environmental objectives, as well as the management plans and programs of measures.[189] Despite these structural differences, comparing Norway and Sweden allows for analytical control[190], given their similarities in RBD management frameworks.

In fact, Sweden and Norway share The Bothnian Bay River Basin District (RBD) with Finland,[191] , enabling joint management efforts, including the establishment of frameworks for EQS and water body classification. This international cooperation provides an additional controlled analytical perspective. Moreover, the Norwegian-Finnish International River Basin

[183] Norwegian Minister of Climate and environment, Information concerning WFD compliance and current Norwegian measures in place to eliminate or reduce the environmental effects of certain activities on water bodies in Norway to ensure the Article 4 WFD requirements, and other relevant requirements, are met, 2022, p.2.
[184] Hanssen, 2016, p. 6.
[185] Indset, 2023, p. 276.
[186] Hanssen, 2016, p. 3.
[187] Ibid, p. 4.
[188] Ibid.
[189] Indset, 2023, p. 276.
[190] Ibid, p. 277.
[191] COM (2019), Member State: Sweden, Report on the implementation of the WFD, p.7.

District, encompassing the Tana, Neiden, and Pasvik rivers, has published a joint RBMP.[192] While hydropower regulation does not exert significant pressure on the Finnish side, it is a crucial water management issue in Norwegian side of the rivers. [193] The RBD Board has the authority to designate HMWB and establish environmental objectives based on case-by-case evaluations of adverse effects.[194]

The Norwegian government has taken measures to protect salmon populations in Norwegian rivers alongside hydropower production. Recognizing that 52 "Salmon Rivers" and 29 "Salmon Fjords" are home to around 75% of Norway's wild salmon, hydropower production must avoid causing considerable harm to these populations. For new hydropower installations, mitigation measures, such as minimum flow requirements, restrictions on dam regulation heights, fish releases, construction of thresholds, and habitat adjustments, must be implemented to obtain a hydropower license. [195]

*4.1.6 EU Assessment of the Norwegian Implementation of the WFD*

Norway has adopted its RBMPs, but the reporting in WISE has not been completed yet at the time when the EU issued the document revising the implementation of the WFD by Member States. . Therefore, the EU has not produced an assessment of Norwegian implementation.[196]

The footnote explains that “Norway is implementing the WFD under a specific timetable agreed pursuant to the Agreement on the European Economic Area (EEA). The RBMPs prepared in 2015 represent the first planning cycle following the formal entry into force of the Directive in Norway. The RBMPs were adopted by County Councils before the end of 2015, and approved by the Central Government on 1 July 2016, and are being implemented for the period 2016-2021.” [197] This also limited a comparative analysis between Swedish, Portuguese, and Norwegian implementation.

[192] Joint water management of the Finnish- Norwegian river basin district (2016-2021) Tana, Neiden and Pasvik catchment areas in Finland and Norway, p.5
[193] Ibid, p.7 & 10.
[194] EFTA Surveillance Authority, Ministry of Climate and Environment, Clarifications regarding the implementation of the Water Framework Directive in respect of heavily modified water bodies, p. 2.
[195] NIVA REPORT (2016), p. 35
[196] COM (2019) Report implementation of the WFD, p. 22
[197] Ibid.

### *4.1.5 PoM*

The implementation of PoMs in Norway is carried out by RBD-boards. These boards consist of representatives appointed by various stakeholders who draft the PoMs. However, the approval of PoMs lies with the Regional Council and the Ministry for Climate and Environment.[198] NVE may provide technical expertise to RBD-boards during these processes. "In addition, NVE is responsible for various management tasks that contribute to the implementation of regional water management plans and the achievement of environmental targets. These tasks include monitoring and ensuring compliance with current license conditions, revising license conditions (Watercourse Regulation Act § 8), initiating license processing and renewal (Water Resources Act §§ 66 and 28), and providing financial grants for environmental measures in waterways. [199]

Improving longitudinal continuity is an important measure included in the Norwegian initiatives. For example, in the Møre og Romsdal RBD, two rivers were prioritized in the revision report by NVE. These rivers have moderate or poor ecological potential due to river regulation. As a result, minimum water flow requirements have been established to achieve the environmental objective.[200]

The EU has not yet published the assessment of Norwegian progress in implementing PoM. Thus, the analysis of the implementation is limited.

## 4.2 The Process of RED Implementation in Norway and its impact on Hydropower

In 2009, the EU introduced the RED, which aimed for a collective 20% renewable energy consumption target by 2020, including national targets. As a participant in the EEA Agreement, Norway was required to contribute to the EU's overall goal.[201] Initially, Norway opposed the binding EU national targets and attempted informal negotiations to influence EU and national representatives. However, these efforts were unsuccessful, leading Norway to enter negotiations with the EU. Eventually, Norway agreed to a renewable energy target of 67.5%

[198] Indset, 2023, p. 279.
[199] NVE, The Water Directive / Water Regulations, https://www.nve.no/vann-og-vassdrag/vassdragsforvaltning/vanndirektivet-vannforskriften/
[200] Action Plan for the Møre og Romsdal Water Region 2022-2027, p. 13.
[201] Skjærseth and Rosendal, 2023, p. 316.

consumption by 2020, compared to the 58.2% renewable energy consumption recorded in 2005.[202]

### *4.2.1 Legislative Measures to Implement the RED in Norway*

The implementation of the RED in Norway is dispersed throughout national legislation, and one key act is the Energy Act, also known as *Energiloven*, which was introduced in 1990. To align with the goals of the RED, Norway introduced amendments to the Energy Act. These amendments aimed to facilitate the production, transformation, transmission, and distribution of electrical energy at high voltage and mandated a license for hydropower operations.[203] Additionally, Norway implemented the Act on Electricity Certificates to promote electricity generation from renewable sources, including hydropower. The Act establishes a national market for electricity certificates, which is linked to the Swedish electricity certificates, establishing the Swedish-Norwegian Green Certificate Scheme.[204] In the Norwegian side of the Scheme, owners of new renewable energy projects, including hydropower, are entitled to receive certificates, while power sellers should purchase certificates to fulfill their quota obligations. This system provides additional income for power producers.[205]

In Norway, another measure that promotes renewable energy is the prohibition of discrimination. As part of the energy policies, grid operators must allow renewable energy installations to connect to their grids, and discrimination against electricity from renewable energy sources is not allowed.[206] The Swedish-Norwegian Green Certificate Scheme is under the authority of NVE, which is responsible for selecting the renewable power plants that will receive the renewable electricity certificates. The scheme promotes, inter alia, the production of hydropower in Norway, as hydroelectricity producers are awarded one renewable electricity certificate for each MWh of electricity produced.[207] Renewable electricity certificates are then traded based on supply and demand. These certificates must be purchased by specific electricity consumers and suppliers, who later surrender the to comply with the scheme. The goal is to

[202] Ibid, p. 321.
[203] Norwegian Ministry of Petroleum and Energy, Energy Facts Norway, Key EU Energy Legislation https://energifaktanorge.no/en/eu-lovgivning/sentrale-direktiver-pa-energiomradet/
[204] Kroepelien, 2020, p.134.
[205] Ibid.
[206] Norwegian Ministry of Petroleum and Energy, Energy Facts Norway, LEGAL SOURCES ON RENEWABLE ENERGY, Norway: Overall Summary http://www.res-legal.eu/search-by-country/norway/
[207] NVE, RME Rapport nr. 8/2022 National Report 2021, Tore Langset and Hege Holte Nielsen, p. 35 & 36 https://publikasjoner.nve.no/rme_rapport/2022/rme_rapport2022_08.pdf

promote the development of renewable energy where it has lower coast.[208] Consequently, hydropower plant operators generate additional revenue from the production of hydroelectricity.

However, the extensive water resources available for hydropower production in Norway also have a significant impact on various species and ecosystems. This impact is particularly evident in the case of wild salmon populations, which Norway seeks to mitigate in new hydropower developments but must reassess in existing and licensed installations.

*4.2.2 Balancing Renewable Energy and Environmental Impacts in Norway*

The reliance on scientific information or on consensus among experts and stakeholders[209] has steadily increased from the 1990s until the 2000s. However, the reliance on consensual scientific knowledge has decreased since then.[210] Rosendal, et al. highlight three key moves that have contributed to this shift in prioritizing ecological knowledge. Firstly, small hydropower plants were allowed to be developed in protected rivers without proper environmental assessments.[211] Additionally, the 2000 Water Resources Act failed to provide legal security for strict nature protection clauses during the re-licensing of existing plants. Administrative guidelines and individual re-licensing cases indicate that nature protection clauses became less stringent than those required for new plants. Furthermore, the central government overruled higher-standard nature protection measures in the Regional Action Plans.[212] This analysis shows that the trend of shortcomings in following ecological knowledge is a challenge for Norwegian hydropower.

The shift away from ecological interests can be understood by examining the structure of hydropower and water management in Norway. The key authorities responsible for water management related to hydropower is the NVE, the central government agency responsible for the management and regulation of water resources and energy in Norway. NVE oversee the licensing process and supervision of hydropower projects, assesses their environmental impact, and ensure compliance with regulations. [213] Their "main statutory objective is to promote socioeconomic development and environmentally sound energy system with efficient and

[208]ELECTRICITY CERTIFICATES Https://energifaktanorge.no/en/regulation-of-the-energy-sector/elsertifikater/
[209] Rosendal, et al. 2019, p. 519.
[210] Ibid, p. 522.
[211] Ibid.
[212] Ibid.
[213] NVE FAKTA, nr. 3 08/2018, The Norwegian power system. Grid connection and licensing, p. 3.

reliable transmission, distribution, trade and use of energy."[214] This means that promotion of renewable energy falls under the responsibility of the same directorate responsible for water management, making impartiality difficult to achieve.

### *4.2.3 The Role of Authorities in Hydropower and Water Management*

It is important to note that other authorities also play a significant role in water management. The Norwegian Environment Agency (*Miljødirektoratet*) provides expertise on environmental matters, assesses the environmental impact of hydropower projects, and sets guidelines for environmental requirements.[215] However, these actors do not have the final decision-making power. Instead, the NVE holds the authority to make decisions regarding large hydropower licenses. The challenge lies in the fact that the NVE's main objective is to promote socioeconomic development and an environmentally sound energy system. The potential conflict arises when the promotion of renewable energy takes precedence over prioritizing environmental protection. In fact, after the implementation of the RED and the certificate system, the NVE approved more licenses to ensure that enough projects would be realized in Norway.[216] The NVE is a governmental agency under the Ministry of Petroleum and Energy and is tasked with managing the country's water resources and energy sector.

In conclusion, the structure of hydropower and water management in Norway presents a complex dynamic. While various authorities are involved in assessing environmental impacts and setting guidelines, the final decision-making power rests with the NVE, which aims to balance socioeconomic development with environmental considerations. This inherent conflict of interest poses a challenge in achieving a harmonious balance between renewable energy production and environmental protection.

This chapter of the thesis focused on the implementation of the WFD and the RED in Norway, specifically in relation to hydropower. It discusses the transposition of the WFD into Norwegian law, including the incorporation of derogation provisions. The chapter also highlights the revision of hydropower license conditions to meet modern environmental standards and the management of RBDs in Norway which also uphold the strategic and integrated planning approach. Norway has undertaken efforts to revise hydropower license

[214] NVE, RME Rapport nr. 8/2022 National Report 2021, Tore Langset and Hege Holte Nielsen, p. 5 https://publikasjoner.nve.no/rme_rapport/2022/rme_rapport2022_08.pdf
[215] Norwegian Environment Agency, Renewable Energy Https://www.environmentagency.no/norwegian-environment-agency/our-responsibilities/
[216] Skjærseth & Rosendal, 2023, p. 325.

conditions, aiming to align them with modern environmental requirements. Additionally, it addresses the implementation of the RED in Norway, including legislative measures and the establishment of the Swedish-Norwegian Green Certificate Scheme.

In terms of the WFD implementation, Norway has transposed the directive into national law and established RBDs to monitor and manage water bodies. However, there are challenges related to the analyze the derogation regime in comparison to Sweden given the absence of EU assessment of the Norwegian implementation. The chapter also compares the RBD management approaches between Norway and Sweden, emphasizing the importance of environmental considerations in hydropower operations.

Regarding the RED, Norway initially opposed the binding EU national targets but eventually agreed to a renewable energy target of 67.5% consumption by 2020. Legislative measures, such as amendments to the Energy Act and the Act on Electricity Certificates, were introduced to facilitate renewable energy production, including hydropower. The Swedish-Norwegian Green Certificate Scheme was established to promote electricity generation from renewable sources and provide additional income for power producers.

# 5 HYDROPOWER: THE PORTUGUESE APPROACH FOR SUSTAINABLE ENERGY TRANSITION IN THE LANDSCAPE OF THE WFD AND THE RED

Like Sweden, Portugal has no significant fossil fuel reserve and has, therefore, relied on import of oil and gas to supply its internal market. The use of hydropower in Portugal has been in place since the final years of the 1800s.[217] However, just like in Norway, the commencement of industrialization was the catalyst for the large-scale development of hydropower in Portugal. It was only after 1974 that the Electricity of Portugal (EDP) was established as the entity responsible for the construction and management of hydropower projects. [218] In 2007, the "National Portuguese Plan for Dams of High Hydroelectric Potential" (PNBEPH), came into effect, aiming to enhance hydropower capacity in Portugal by building 10 large hydropower

[217] Batel and Küpers, 2022, p. 5.
[218] Ibid, p. 6.

plants.[219] Not only EDP, but also the Spanish companies Iberdrola and Endesa have received concessions for these projects.

In fact, Iberdrola is currently constructing a hydropower complex on the Tâmega River, which they claim to be one of the largest initiatives in the Portuguese hydropower sector. Furthermore, this project represents for 50% of the objective set by the PNBEPH. The aim is to have the commercial activities of the Tâmega enabled by June 2024.[220] The project is located in the northern part of Portugal, withing the RBD Douro and the RBD Cavado, Ave and Leca. Therefore, it is pertinent to assess the experiences from Sweden and Norway can be of valuable for the Portuguese implementation of WFD objectives in the context of the recent hydropower development.

## 5.1 Hydropower Development and Water Framework Directive Implementation in Portugal: Achievements, Challenges, and Future Plans

In Portugal, the Water Law (Law no. 58/2005 of 29.12) has been enacted to transpose the WFD. The Portuguese implementation shares similarities with Sweden, particularly in terms of the timeframe, as both countries are EU Member States and became bound to the WFD simultaneously.

Since its enactment in 2005, the Portuguese legislation has undergone five amendments.[221] While the Water Institute, as the national authority, has the mandate to fulfill the environmental objectives of the Portuguese Water Law,[222] the RBDs Administrative Body is responsible for the planning, licensing, and supervision of water activities.[223]

### *5.1.1 RBD*

Unlike Norway and Sweden, Portugal has established eight continental RBDs and two island RDBs, as stated in Article 6 of the Water Law. Additionally, three of the continental RBDs are constitute international RBDs shared with Spain.[224] For the continental RBDs, five RBDs Administration Bodies were created through Article 9 of the Water Law. These bodies are

[219] Ibid, p. 7.
[220] Iberdrola, Sistema Eletroprodutor do Tâmega, https://tamega.iberdrola.pt/projeto/.
[221] APA, Portuguese Environment Agency https://apambiente.pt/agua/lei-da-agua.
[222] Article 7.1 (a) of the Water law.
[223] Article 7.1 (b) combined with Article 8 of the Water Law.
[224] Article 6.2 of the Water law.

responsible for various tasks, including identifying the water status in the respective RBDs and designing the RBMP and PoMs for the management of the river basins.

Among the Portuguese RBDs, the Açores holds a prominent position as it has the largest number of measures financed by public funds.[225] In fact, the Açores RBD has reported various pressures that affect its water bodies, including extensive hydro-morphological adjustments for hydropower production, which hinder the achievement of environmental objectives.[226] However, it is not only Açores that experiences the impacts of hydropower production. Six out of the eight RBD in Portugal are under flow obstruction or water diversion for hydropower production.[227] Several measures have been undertaken by Portuguese RBDs to address the impacts of hydropower development. These measures aim to promote the sustainability of water abstractions and minimize hydro-morphological changes.[228]

Moreover, both Douro RBD and the Cavado, Ave and Leca RBD report the obstacles in the implementation of the WFD.[229] These challenges arise while a major hydropower plant, namely the Tâmega hydroelectric project, is under construction in the Douro RBD.

### *5.1.2 Derogation Regime of Article 4.7 in Portugal*

In Portugal, the derogation Regime of the WFD was transposed into the Water Law, more specifically in Article 51 titled Derogation (*Derrogações)* and Article 52, The transposition closely mirrors the content of the WFD, particularly Article 4.7. The Portuguese Water Law incorporates the necessary provisions for derogations and their applicable conditions as outlined in Article 51 and Article 52.

However, the approval and implementation of dam projects in Portugal, as part of the country's PNBEPH, posed significant challenges to meeting the goals of the WFD. These dam projects did not fully adhere to the requirements of the WFD regarding new modifications to water bodies, including mitigation measures, inclusion, and justification in RBMPs, and demonstration of the lack of alternatives.[230]

[225] COM, Assessment of progress in PoMs, Member State: Portugal, p. 15.
[226] Ibid, p. 35.
[227] Ibid p. 45.
[228] Ibid, p. 23.
[229] Ibid, p. 20.
[230] Martínez-Fernández, 2020, p. 564.

Despite this, not all ten planned projects came to fruition. The Alvito Dam project was cancelled in 2011, and the Fridão project was postponed. In 2016, the Fridão Dam was suspended, and a new memorandum of understanding was signed between the Portuguese government and EDP. Eventually, in 2019, the Fridão Dam project was officially cancelled. Environmentalists exerted pressure against these projects and the broader dam-building program. However, the cancellation of many projects was primarily driven by diminished company interest and economic infeasibility. The Almourol and Pinhosão Dam projects were never initiated due to a lack of interest from hydropower companies influenced by an unfavorable economic context.[231]

It is important to note that the development undertaken by Iberdrola in the Tâmega River stands as an exception. The construction of three large new dams and three hydropower plants is currently underway in the Tâmega River Basin in northern Portugal. [232] Already in 2010, it was understood that under the terms of Article 15 of the WFD, relating to the characterization of river basins, the Tâmega river would be classified as bodies of water at "risk" of not achieving good (ecological) status and/or chemical).[233]

Portugal clarified in its RBMP that the PNBEPH, which encompasses the relevant projects, was approved in 2007, and that all the required analyses under Article 4.7 had already been conducted as part of the Strategic Environmental Assessment (SEA). The Commission also affirms that the objectives of the Plan and the assessment of alternative solutions have been thoroughly addressed within the framework of the SEA of the PNBEPH. In the subsequent RBMPs, the authorization of the projects was no longer in question.[234] However, in this regard, the Commission recommended that new hydropower projects should be justified, particularly through the assessment of alternative options. The recommendation has been partially fulfilled, as the Commission assesses that further detailed assessments and justifications at the water body level are still necessary to enable informed decision making.

In conclusion, Portugal effectively transposed the derogation provisions of the WFD into its Water Law. Furthermore, the Commission's assessment indicates that comprehensive

[231] Ibid.
[232] European Investment Bank, TAMEGA IBERDROLA HYDROPOWER AND STORAGE PORTUGAL https://www.eib.org/en/projects/pipelines/all/20150651
[233] APA, (*Estudo de Impacte Ambiental: Aproveitamento Hidroeléctrico de Fridão*) Environmental Impact Study: Fridão Hydroelectric Development, p. 27.
[234] COM (2019) Report on the implementation of the WFD Member State: Portugal, p 98.

assessments at the strategic level were conducted. However, it is advised that Portugal enhances its decision-making process through more thorough assessments of the water bodies involved.

*5.1.3 Portuguese National Water Plan (NAP)*

In Portugal, the NAP was established by the Law 76/2016. The primary objective of the NAP is to protect and promote good state of water and terrestrial ecosystems.[235] It also acknowledges the importance of implementing measures to mitigate the impacts of the renewable energy action plan on watercourses. The latter aims to promote the extraction of hydropower in Portuguese rivers.[236] While the NAP does not explicitly mention mitigation measures for hydropower production, it can be inferred that environmental assessment required before for licensing include the need of such measures.

According to the Portuguese NAP, all projects, including hydropower operations, are subject to environmental assessment in accordance with the law. The assessment of plans and projects must take place prior to the decision to build an installation and at that moment, confronted with the environmental objectives and subject to the environmental requirements that must be upheld to ensure that these are not compromised.[237]

In this regard, the Water Law establishes in Article 30.3 (d) that the PoMs must include measures aimed at controlling the abstraction of surface water, including the creation of dams and other hydraulic infrastructure. Which should be achieved through the establishment of a licensing or registration regime. Additionally, Article 30.3 (u) of the Water Law states that licensing requirement can be used to maintain and improve the hydro-morphological conditions of water bodies.

The licensing for hydropower projects is governed by Law 58/2005, which establishes that the utilization of water for hydropower production is subject to concession.[238] These concessions can be issued for a 75-year period.[239] The competent authority in mainland Portugal for water resource licensing is the Portuguese Environment Agency (APA), through the territorially competent RBD.[240] The involvement of the Portuguese Environment Agency (APA) in the

[235] National Water Plan (NAP) Law 76/2016 NAP
[236] Annex of the NAP Law 76/2016, p. 3956.
[237] Annex, 3.10, of the NAP Law 76/2016, p. 3991
[238] Article 61 of Law 58/2005
[239] Article 68 (6) of Law 58/2005.
[240]APA, Licenciamento, https://apambiente.pt/agua/licenciamento

licensing process for hydropower projects suggests a focus on environmental considerations. As the competent authority for water resource licensing in mainland Portugal, the APA is responsible for ensuring compliance with environmental regulations and objectives. This includes evaluating the potential environmental impacts of hydropower projects and imposing conditions or mitigation measures to minimize negative effects on the environment and water resources.

In conclusion, the involvement of the Portuguese Environment Agency (APA) in the licensing process for hydropower projects in mainland Portugal reflects a commitment to considering environmental considerations. As the competent authority for water resource licensing, the APA is responsible for ensuring compliance with environmental regulations and objectives. This includes conducting environmental assessments to evaluate the potential impacts of hydropower projects and imposing necessary conditions or mitigation measures to minimize adverse effects on the environment and water resources.

Comparatively, the Norwegian model, where the licensing of hydropower falls under the Ministry of Petroleum and Energy,[241] may not be the most suitable option for Portugal. In the Swedish approach it is through the judicial system that hydropower concessions are granted.[242] The Norwegian and Swedish structures do not seem to provide a possible better practice for Portugal regarding licensing authority. As explored in Chapter 3, the Swedish approach has not been fruitful, considering that the Swedish courts are not considered to have fully adhered to the environmental objectives of the WFD.

Overall, Portugal's involvement of the APA and the requirement for environmental assessments demonstrate a balanced approach to hydropower licensing that considers both energy production and environmental protection. Thus, Portugal does not necessarily need to adopt the specific structures found in Nordic countries, as its current system reflects a commitment to sustainable development and environmental stewardship.

### *5.1.4 PoM*

In Portugal, each the RBDs report individually on the measures adopted.[243] Additionally, Portugal has reported through its individual RBDs the implementation of a system of license

[241] The NVE is a governmental agency under the Ministry of Petroleum and Energy.
[242] SEI (2011), p.7
[243] EC, Assessment of progress in PoMs, Member State: Portugal, p. 25.

or authorization to control physical modifications to water bodies, as stated in Article 11.3.i WFD.[244] Furthermore, registers are in place across all RBDs to document the extent of physical modifications of water bodies.[245]

Regarding the PoMs in Portugal, several significant actions focus on the sustainable management of water abstractions, the reduction of hydro-morphological changes, and risk minimization. In the RBDs located on islands, there is a specific classification of PoMs that does not directly reference hydro-morphological changes or risk minimization but rather emphasizes risk management.[246]

Improvements in longitudinal continuity, such as the establishment of fish passes and the demolition of old dams, have been undertaken in the Tagus and Western Rivers RBD to address pressures on surface water bodies.[247] These pressures, similar to those faced by Swedish authorities, include dams, barriers, and locks caused by hydropower, among other factors. However, it is worth noting that the Tagus and Western Rivers RBD did not have any planned measures in the reference years of 2018 to achieve the environmental objective of GEP, despite the presence of significant hydro-morphological alterations.[248]

In general, there are fewer measures planned for 2027 compared to 2018. Another measure aimed at achieving the objectives of the WFD is the improvement of the flow regime and/or the establishment of ecological flows, which has been addressed in all RBDs except the island RBDs, to mitigate pressures on surface water bodies. In six RBDs, pressures from hydropower operations, such as abstraction or flow diversion and hydrological alterations, have been identified..[249] With the exception of the Minho and Lima RBD, all RBDs have planned measures to improve the flow regime and/or establish ecological flows by 2027. For these pressures, the Cavado, Ave, and Leca RBDs have planned four measures, while the Douro RBD has planned three measures. However, by 2027, only one measure is scheduled to be implemented in Cavado, Ave and Leca RBD.[250]

[244] Ibid.
[245] Ibid.
[246] Ibid, p. 18.
[247] Ibid, p. 47.
[248] Ibid.
[249] Ibid, p. 45.
[250] Ibid.

*5.1.4 EU Assessing Portuguese WFD implementation.*

Three phases of RBMPs have been conducted in Portugal. The first phase included plans developed before the Water Law, prior to the implementation of the WFD. The second and third phases involved the adoption of RBMPs in line with the WFD planning cycle.[251] Henceforth, the second and third RBMPs will be referred to as the first and second RBMPs, respectively.

The European Commission has prepared a Working Document for the second RBMP submitted by Portugal, following a similar approach used for Sweden. This document evaluates Portugal's compliance with previous recommendations. In all RBDs identified significant hydromorphological pressures caused by, among other things, hydropower operation. However, the Madeira RBD does not report measures specifically addressing these pressures, despite indications in the RBMP that measures related to habitat restoration and sediment management would be implemented.[252]

A key Commission recommendation was regarding hydro-morphological changes from water activities, stating that new developments such as hydropower plants should comply with the derogation regime of the WFD. This includes providing justifications and implementing necessary mitigation measures. The Commission's assessment found that strategic-level assessments were conducted in accordance with Article 4.7 of the WFD.[253] However, more detailed assessments and justifications at the water body level are needed to make informed decisions. Therefore, this recommendation has been partially fulfilled.

The Commission's recommendations for the second RBMPs and PoMs in Portugal involve other two actions. Firstly, promoting effective coordination among public administration and stakeholders, particularly by involving River Basin Councils, to enhance planning, implementation, and monitoring of PoMs. However, Portugal did not provide sufficient information for the Commission to assess improvements in these areas. [254]

Secondly, initiating RBMPs for international river basin districts (RBDs) in cooperation with Spain was recommended. This cooperation should include mapping pressures and impacts, establishing joint monitoring systems, adopting common assessment methodologies, and

[251] Fidelis and Rodrigues, 2019, p. 159.
[252] COM (2019) Report on the implementation of the WFD Member State: Portugal, p. 147.
[253] Ibid, 122
[254] Ibid, p. 26.

developing PoMs. Although some cooperation took place in 2015, Portugal failed to establish joint plans or actions with Spain as recommended. However, recent collaboration between Portugal and Spain has partially fulfilled this recommendation, as acknowledged by the Commission. [255]

In summary, the Commission's recommendations highlight the need for enhanced coordination and cooperation in planning, implementing, and monitoring water management measures in Portugal, both domestically and internationally. The successful international cooperation between Sweden, Finland, and Norway, particularly in the case of the Torne River, can serve as a model for Portugal. The Torne River exemplifies a situation where there is extensive economic integration, prior collaboration in the river basin, strong environmental commitment, and a legal obligation to implement the WFD. The three Nordic States considerable environmental awareness and commitment created favorable conditions for the effective implementation of the WFD, regarding international cooperation.[256]

By looking to the successful Nordic cooperation as a model, Portugal can transfer this heightened environmental consciousness to its collaboration with Spain, potentially leading to positive influence on Portuguese international cooperation and aligning with the Commission's recommendations. Such an approach has the potential to strengthen environmental efforts and support effective implementation of the WFD.

### 5.2 Hydropower and Implementation of the RED in Portugal

The RED has been transposed into the national legal system through the enactment of Law 15/2022. This law establishes the organizational structure and functioning of the National Electricity System (NES), thereby ensuring compliance with the requirements set forth in the RED and facilitates the integration of renewable energy sources into the national electricity system.

The National Energy and Climate Plan was also implementing the objectives of the EU directive. The Plan is a strategic document that outlines the national energy and climate objectives and the policies and measures to achieve them. It sets specific targets for renewable

[255] Ibid.
[256] Jager, 2016, p. 288.

energy deployment and provides a roadmap for the development of renewable energy source. SEA for large scale energy project is also one of the tools to achieve the RED objectives.

### *5.2.1 Meeting Renewable Energy Targets and Balancing Environmental: Considerations in Portugal's Hydropower Development*

Pursuant to the RED, Portugal initially aimed to achieve a 31% share of renewables in gross final energy consumption by 2020. However, Portugal surpassed this target and successfully achieved a 34% share of renewables in 2020.[257] Moving forward, the established target for the year 2030 is set at 47% of renewables in gross final energy consumption. [258] This ambitious target reflects Portugal's compelling necessity to accelerate the development of renewable energy sources.

To meet the renewable energy production goals, Portugal aims to increase its hydropower production capacity by 1.2 to 1.7 GW by 2030. This will involve raising the capacity from 7.0 GW in 2020 to 8.2 GW to 8.7 GW by 2030.[259] The expansion justifies the reinforcement of national hydropower production potential, particularly in the Douro RBD. To realize these capacity plans, the construction of the Alto Tâmega hydroelectric complex has been initiated. This hydropower park comprises three plants: Gouvães, Alto Tâmega, and Daivões. The Alto Tâmega hydroelectric complex is projected to provide 1.2 GW of renewable energy capacity[260], contributing not only to the enhancement of energy security in Portugal but also playing a crucial role in achieving the goals set by the RED for Portugal. However, it is important to note that this project has been identified as a contributing factor to the failure in achieving a good ecological status for the Tâmega River.

Acknowledging the importance of rational water resource use in meeting energy needs, including environmental considerations, Portugal's 2018 National Energy and Climate Plan recognizes the role of water in energy sufficiency.[261] While rational water use is crucial, balancing energy needs with environmental concerns, particularly in hydropower exploitation, is essential. Portugal has developed stringent standards for selecting suitable sites for large-

[257]EUROSTAT, EU overachieves 2020 renewable energy target, https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220119-1.
[258] National Energy and Climate Plan 2021-2030 (NECP 2030) Portugal, December 2019, p. 33. https://energy.ec.europa.eu/system/files/2020-06/pt_final_necp_main_en_0.pdf
[259] National Energy and Climate Plan 2021-2030 (NECP 2030) Portugal, December 2019, p. 38.
[260] Ibid, p. 35.
[261] Ibid, p. 9.

scale hydropower operations, considering environmental, social, and economic factors to ensure responsible development.

The Climate Framework Law (*Lei de Bases do Clima, Law No. 98/2021*) outlines Portugal's climate policy. Its primary objective, as stated in Article 2, is to achieve ecological balance, combat climate change, and facilitate a socially balanced transition to a sustainable economy and a greenhouse gas (GHG) neutral society. Article 52 emphasizes the importance of equitable and efficient water use, mandating the implementation of water planning and management to ensure water security, protect biodiversity, and support socioeconomic activities in a fair manner. These measures aim to reduce vulnerability, enhance resilience to climate change, and promote sustainable water management practices.

Despite the goals set by the RED and climate policy, comprehensive assessments of the overall impact on water bodies are lacking when exploiting water resources in Portugal. It is crucial to address this gap and reconcile conflicts between hydropower production and biodiversity conservation with equal urgency.

In Portugal, a certification scheme for renewable energy is implemented, known as "Garantia de Origem" (Guarantees of Origin or GO). This scheme resembles the Swedish-Norwegian Green Certificate Scheme. The GO market in Portugal involves energy suppliers being required to hold a quota of renewable energy certificates. These certificates serve as evidence that the generated energy is from renewable sources and can be traded independently of the electricity itself. [262]

Renewable energy producers in Portugal have the opportunity to obtain GO certificates for each megawatt-hour (MWh) of renewable electricity they generate. [263] It is worth noting that the market mechanism also benefits hydropower production in Portugal. The main objective of the GO scheme in Portugal is to differentiate the environmental attributes of the energy product.

Portugal can draw a valuable lesson from the implementation of the Nordic Green Certificate scheme, particularly regarding the opportunity to establish a connection with Spain. Such a connection would significantly expand and diversify the scheme's scope. It is crucial to recognize that Portugal and Spain have interconnected electricity grids and engage in cross-

[262] *Direção Geral de Energia e Geologia, Leilões de Garantias de Origem*, Directorate General for Energy and Geology, Auctions of Guarantees of Origin https://www.dgeg.gov.pt/pt/areas-setoriais/energia/energia-eletrica/servicos-e-redes/leiloes-de-garantias-de-origem/#a1
[263] Ibid.

border energy trading. However, to establish a linkage between their respective Guarantee of Origin (GO) schemes, both countries would need to adapt their national legislation accordingly. This adjustment is necessary to facilitate a comprehensive and harmonized implementation of the GO scheme, fostering enhanced collaboration and integration within the renewable energy market.

### *5.2.2 Hydropower Development in Portugal's Energy Transition: Meeting Renewable Energy Targets and Addressing Environmental Considerations*

In line with Portugal's commitment to transitioning its electricity sector towards renewable sources and ensuring compliance with the RED, strategic decisions have been made to prioritize the development of electricity generation from renewable sources. [264] This transition aims to effectively decarbonize the electricity sector, promote sustainability, and reduce greenhouse gas emissions. As an integral part of this transition, the implementation of storage systems in various forms is considered essential and indispensable. These storage systems play a crucial role in facilitating the optimal management of the national energy system across its different sub-sectors. By promoting flexibility and stability, these storage systems serve as vital tools in ensuring the reliable operation and resilience of the national electricity system.[265] However, it is important to acknowledge that the production of renewable energy sources, including hydropower, is not without its impacts. The development and operation of hydropower projects can have environmental and social consequences that must be considered within the legal and regulatory framework. These impacts require careful consideration and the implementation of appropriate mitigation measures to address any potential harm to ecosystems, water resources, and local communities.

Therefore, it is crucial to continue focusing on the implementation of reversible pumping systems in hydroelectric plants and explore other technological solutions, such as battery and hydrogen technologies. A significant share of the new storage capacity will be directly associated with renewable electricity generation centers. [266]

In terms of electrical power, storage is recognized as a tool for enhancing the flexibility and stability of the National Electricity System. By 2030, storage capacity is expected to increase,

[264] National Energy and Climate Plan 2021-2030 (NECP 2030) Portugal, December 2019, p. 38.
[265] Ibid.
[266] Ibid, p. 45.

primarily through the implementation of reversible hydroelectric pumping facilities. Later in the decade, contributions from battery and hydrogen technologies will further augment the storage capacity. A significant portion of this capacity is associated with generation facilities utilizing wind and solar technologies, while the remaining capacity is dedicated to storage. [267]

Certain hydroelectric projects equipped with storage capacity and reversibility, such as Gouvães with reversibility, Daivões, and Alto Tâmega, are scheduled to become operational by 2026. These projects will play a crucial role in increasing the system's flexibility in integrating intermittent renewable production. The utilization of this technology provides an operational reserve for rapid mobilization, enabling efficient management of rising and falling reserves. [268]

This chapter discusses Portugal's approach to hydropower development and its implementation of the WFD. It highlights the Portuguese aim at enhancing hydropower capacity while it addresses the challenges faced in implementing the WFD, such as the impacts of hydropower production on water bodies and the need for more thorough assessments and justifications for new hydropower projects. It develops into APA and its responsibility to oversee and proceed licensing process for hydropower projects. The PoMs implemented by the RBDs to promote sustainable water management and minimize hydro-morphological changes are also explored.

# 5. CONCLUSION

In conclusion, the analysis of the Swedish, Norwegian, and Portuguese contexts regarding the implementation of the WFD demonstrates varying degrees of success and shortcomings in each jurisdiction. Sweden has effectively transposed the WFD's environmental objectives into national regulations, with the Water Authorities overseeing EQS compliance and the adoption of the NAP to review hydropower plant licenses. However, shortcomings exist in the implementation of the derogation regime specified in Article 4.7 of the WFD, ambiguous transposition of EQSs, and inadequate addressing of projects incompatible with environmental goals are other challenges. The adoption of the NAP to review existing hydropower plant licenses is another successful example, given that it enables the strategic and integrated planning approach recommended in the EU non-binding guidelines. The objective of the Plan

[267] Ibid.
[268] Ibid, p. 50.

is to bring hydropower operations in line with MER while maximizing hydroelectricity production capacity.

Norway differs from Sweden in its implementation approach, with a larger number of RBDs and a commitment to aligning longstanding hydropower licenses with modern environmental standards. Nevertheless, shortcomings exist in Norway's derogation regime, including the absence of the term “overriding public interest” in legislation potential and the prioritization of renewable energy over nature protection.

Portugal demonstrates accuracy in transposing the derogation regime into national law, without shortcomings like Sweden and Norway. It has multiple continental and island RBDs, implements measures to promote water abstraction sustainability and minimize hydro-morphological changes caused by hydropower, and has an environmental authority leading the hydropower licensing process. However, Portugal faces pressures on water bodies due to extensive hydro-morphological adjustments for hydropower production, insufficient measures in some RBDs to achieve environmental objectives, challenges in implementing the WFD in areas affected by the Tâmega hydroelectric project, and non-compliance with WFD requirements in certain dam projects.

Norway and Sweden provide an important model for international cooperation in river basins. They have not only cooperated with each other but also with Finland. Portugal should be inspired by the cooperation lines pursued bey Sweden and Norway and consider engaging in international cooperation with Spain in the shared RBDs to ensure holistic management of the river basin.

Furthermore, it is evident that potential cooperation between Portugal and Spain, through the establishment of an international certificate scheme that links to the existing GO scheme, could stimulate further development in hydropower production. However, such cooperation should only be pursued if the increase in hydropower production can be justified in terms of its environmental impacts.

Comparing the hydropower licensing processes, Swedish and Norwegian procedures face challenges from different channels and do not demonstrate higher suitability than the Portuguese licensing process. Notably, the Portuguese process shows a stronger environmental perspective with an environmental authority in charge. Furthermore, the Portuguese PoMs lack clarity on the removal of barriers for enhancing longitudinal continuity compared to the explicit

intentions stated in the Swedish PoMs. Given the critical role of fragmentation in freshwater biodiversity decline and the impact of hydropower operations on water continuity, Portugal should consider examining and adopting Swedish measures aimed at improving continuity.

Conducting such analyses involves a thorough understanding of EU environmental law and its transposition into national legislation. Given the big range of legislations involved, it has been a challenge to provide such a comparative analysis. It requires information gathering and exchange between jurisdictions to understand best practices and address common challenges. Overall, continuous commitment from stakeholders is crucial to address shortcomings and enhance the implementation of the WFD in the context of hydropower exploration.

Ultimately fostering sustainable environmental practices and achieving the conflicting objectives require the involvement of multiple stakeholders and a higher reliance in the scientific knowledge.

# 6. REFERENCE LIST

## 6.1 Literature


Books

Bodansky, Daniel, *The Art and Craft of International Environmental Law*, Harvard University Press 2010.

Michanek, Gabriel & Zetterberg, Charlotta, *Den Svenska Miljörätten*, 5th edition, Iustus, 2021.

Daniel Bodansky et al. *International Climate Change Law*, Oxford University Press, 2017.

Langlet David & Mahmoudi Said, *EU Environmental Law and Policy*, Oxford University Press, 2016.

Booth, Wayne C. et al., *The Craft of Research*, 2nd edition, The University of Chicago Press, 2003.

Article in a journal

Hanssen, Gro Sandkjær, "Implementing EUs Water Framework Directive in Norway: Can the New River Basin Districts Ensure Environmental Policy Integration?" (2016) 4(13) *International Journal of Water Governance* 1-25.

Jackson, Andrew L. R., "Renewable energy vs. biodiversity: Policy conflicts and the future of nature conservation", (2011) 21(4) Global *Environmental Change*, 1195-1208.

Lindström, Andreas & Ruud, Audun, "Whose Hydropower? From Conflictual Management into an Era of Reconciling Environmental Concerns; a Retake of Hydropower Governance towards Win-Win Solutions?" (2017) 9(7) *Sustainability*, 1-18.

Alfredsen, Knut, et al., "A synoptic history of the development, production and environmental oversight of hydropower in Brazil, Canada, and Norway" (2022) 849 *Perspectives on Sustainable Hydro-Power*, 269–280.

Taekema, Sanne, "Relative Autonomy, A Characterisation of the Discipline of Law" (2010) *SSRN* 1-20.

Gracey, Erik Olav & Verones, Francesca, "Impacts from hydropower production on biodiversity in an LCA framework—review and recommendations" (2016) 21 *The International Journal of Life Cycle Assessment*, 412–428.

Renöfält, Birgitta Malm, et al. "Effects of hydropower generation and opportunities for environmental flow management in Swedish riverine ecosystems" (2009) 55(1) *Freshwater Biology*, 49-67.

Kaijser Arne & Högselius Per, "Under the Damocles Sword: Managing Swedish energy dependence in the twentieth century" (2019) 126 *Energy Policy*, 157-164.

Lackey, Robert T., "Seven Pillars of Ecosystem Management", (1998) 40 *Landscape and Urban Planning*.21-30.

Rosendal, Kristin, et al., "Knowledge-based management of protected areas and hydropower: the case of Norway" (2019) 19 *International Environmental Agreements*, 515–530

Söderasp, Johanna & Pettersson, Maria, "Before and After the Weser Case: Legal Application of the Water Framework Directive Environmental Objectives in Sweden" (2019) 31 *Journal of Environmental Law*, 265–290.

Indset, Marthe "When multilevel water management meets regional government: the differential impacts on administrative integration" (2023) 32(2) *Environmental Politics*, 271-293.

Skjærseth Jon Birger & Rosendal Kristin "Implementing the EU renewable energy directive in Norway: from Tailwind to Headwind" (2023) 32(2) *Environmental Politics*, 316-337.

Batel Susana & Küpers Sophia, "Politicizing hydroelectric power plants in Portugal: spatio-temporal injustices and psychosocial impacts of renewable energy colonialism in the Global North" (2022) *Globalizations*, 2-20. https://doi.org/10.1080/14747731.2022.2070110

Fidelis, Teresa & Rodrigues, Carla, "The integration of land use and climate change risks in the Programmes of Measures of River Basin Plans – assessing the influence of the Water Framework Directive in Portugal" (2019) 100 *Environmental Science and Policy* 158–171.

Jager, Nicolas W., "Transboundary Cooperation in European Water Governance – A set-theoretic analysis of International River Basins" (2016) 26 *Environmental Policy and Governance* 278-291 https://doi.org/10.1002/eet.1717

Martínez-Fernández, Julia, et al. “The role of the Water Framework Directive in the controversial transition of water policy paradigms in Spain and Portugal” (2020)13(3) *Water Alternatives* 556-581.

Chapter/article

Banet, Catherine, “The Use of Market-Based Instruments in the Transition from a Carbon-Based Economy”, in Don Zillman and others (eds), *Beyond the Carbon Economy: Energy Law in Transition.* Oxford, 2008, p. 207-230.

Kampa, Eleftheria, “Policy Framework for Hydropower Mitigation”, in Rutschmann, Peter et al. *Novel Developments for Sustainable Hydropower*. Springer, 2022, p. 1–11.

Ajani, Gianmaria, “Legal Transplants” in Marciano, A., Ramello, G.B. (eds) *Encyclopedia of Law and Economics*. Springer, 2019, 1282–1288.

Vogler, John, “European Union Environmental Policy” in Elliott, Lorraine, & Breslin, Shaun (eds) *Comparative Environmental Regionalism*, Taylor & Francis Group, 2011, 19-36.

Kroepelien, Knut F., “EU Law and Norwegian Hydropower Legislation: A Challenging Interface” Martha M. Roggenkamp & Catherine Banet (eds) *European Energy Law Report XIII (European Energy Law Reports*, Intersentia, 2020, 127-152. https://www.cambridge.org/core/books/abs/european-energy-law-report-xiii/eu-law-and-norwegian-hydropower-legislation-a-challenging-interface/1D45D26519CFADCDEBC7CFCAC1CB0386 (Last accessed 27 May 2023).

Report

COM (2021) *EU’s Global Leadership in Renewables Final synthesis report July 2021*. Luxembourg: Publications Office of the European Union.

SEI (2011) *Constant Concessions Under Changing Circumstances: The Water and Renewable Energy Directives and Hydropower in Sweden*. Stockholm Sweden: Stockholm Environment Institute. Project Report.

NIVA, Norwegian Institute for Water Research (2016). *Hydropower in Norway, An overview of key tools for planning, licensing, environmental impacts and mitigation measures*

NVE, (2022) The Norwegian Water Resources and Energy Directorate, RME Rapport nr. 8/2022 National Report 2021, Tore Langset and Hege Holte Nielsen, https://publikasjoner.nve.no/rme_rapport/2022/rme_rapport2022_08.pdf (Last accessed 27 May 2023).

NVE, (2018) The Norwegian power system. Grid connection and licensing nr. 3 08/2018. https://publikasjoner.nve.no/faktaark/2018/faktaark2018_03.pdf (Last accessed 27 May 2023).

Our Would in Data (2022) Ritchie, Hannah et al. "Energy", https://ourworldindata.org/energy (last accessed 27 May 2023).

APA, (2010) Environmental Impact Study: Fridão Hydroelectric Development, Preliminary draft, Opinion of the Evaluation Committee.

### 6.2 Official Source and Treaties

Legislation:

Convention on Biological Diversity (CBD) (adopted on 5 June 1992, entered into force 29 December 1993) 31 ILM 818.

Paris Agreement (adopted on 12 December 2015, entered into force 4 November 2016) 55 ILM.

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. (OJ L 327, 22.12.2000, p.1).

Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast) (OJ L 328 21.12.2018, p. 82).

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206 22.7.1992, p. 7).

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version) (OJ L 020 26.1.2010, p. 7).

Swedish Environmental Code (*Miljöbalken*) 1998:808 https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/miljobalk-1998808_sfs-1998-808 (Last accessed 27 May 2023).

Swedish Act on Electricity Certificates (*Lag om elcertifikat*) 2011:1200 <https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lag-20111200-om-elcertifikat_sfs-2011-1200> (Last accessed 27 May 2023).

Climate Act (*Klimatlag*) 2017:720 https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/klimatlag-2017720_sfs-2017-720 (Last accessed 27 May 2023).

Prop. 2022/23:1 Expenditure area 21, p. 21 (*Prop. 2022/23:1 Utgiftsområde 21*) https://data.riksdagen.se/fil/28D34D6E-579A-4E8A-8842-D870FFD091B2 (Last accessed 27 May 2023).

The Norwegian Water Regulation (*Vannforskriften: Forskrift av 15. Desember 2006 nr. 1446 om rammer for vannforvaltningen*) https://lovdata.no/dokument/SF/forskrift/2006-12-15-1446 (Last accessed 27 May 2023).

The Norwegian Watercourse Regulation (*Vassdragsreguleringsloven av 14. Desember 1917*) https://lovdata.no/dokument/NL/lov/1917-12-14-17 (Last accessed 27 May 2023).

The Portugese Water Law, (*Lei da Água n.o 58/2005*) https://files.dre.pt/1s/2005/12/249a00/72807310.pdf

National Water Plan (NAP) Decree-Law No. 76/2016 approving the National Water Plan (NAP). (Plano *Nacional da Água, Decreto-Lei n.o 76/2016*)

Official Information and Guidelines

Government.no, Ministry of Petroleum and Energy, The History of Norwegian Hydropower in 5 Minutes, 2016. <https://www.regjeringen.no/en/topics/energy/renewable-energy/the-history-of-norwegian-hydropower-in-5-minutes/id2346106/> (Last accessed 27 May 2023).

European Commission, Energy; Hydropower. <https://energy.ec.europa.eu/topics/renewable-energy/hydropower_en> (Last accessed 27 May 2023).

Swedish Energy Agency, Energy in Sweden 2022 An overview, P.7. <https://www.energimyndigheten.se/en/news/2022/an-overview-of-energy-in-sweden-2022-now-available/> (Last accessed 27 May 2023).

The Norwegian Water Resources and Energy Directorate (NVE), About NVE, <https://www.nve.no/about-nve/> (Last accessed 27 May 2023).

The Norwegian Water Resources and Energy Directorate (NVE), The Water Directive / Water Regulations, <https://www.nve.no/vann-og-vassdrag/vassdragsforvaltning/vanndirektivet-vannforskriften/> (Last accessed 27 May 2023).

EUROSTAT, EU overachieves 2020 renewable energy target. <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220119-1> (Last accessed 27 May 2023).

EC, Water Framework Directive, <https://environment.ec.europa.eu/topics/water/water-framework-directive_en> (Last accessed 27 May 2023).

COM, Common Implementation Strategy for The Water Framework Directive (2000/60/EC) Guidance Document No 4 Identification and Designation of Heavily Modified and Artificial Water Bodies Produced by Working Group 2.2 – HMWB, 2003.

COM, Renewable Energy, https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en (Last accessed 27 May 2023).

COM, Renewable Energy Directive Targets and Rules https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en (Last accessed 27 May 2023).

COM, National energy and climate plans, EU countries' 10-year national energy and climate plans for 2021-2030. https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en (Last accessed 27 May 2023).

COM (2018) Guidance on the Requirements for Hydropower in Relation to EU Nature Legislation, 2018. https://ec.europa.eu/environment/nature/natura2000/management/docs/hydro_final_june_2018_en.pdf (Last accessed 27 May 2023).

Swedish Water Authorities, About the Water Authorities https://www.vattenmyndigheterna.se/other-languages/english.html (Last accessed 27 May 2023).

Havs- och vattenmyndigheten, Energimyndigheten och Svenska kraftnät, Förslag till Nationell Plan för Omprövning av Vattenkraft med Beskrivning av Vattenmiljö och Effektiv Tillgång till Vattenkraftsel samt Identifierade Behov för Fortsatt Arbete, 2019, (Translated by the author) *Swedish 2019 National Plan for Modern Environmental Requirement.*

COM COMMISSION STAFF WORKING DOCUMENT Second River Basin Management Plans – Member State: Sweden Accompanying the document REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC) Second River Basin Management Plans First Flood Risk Management Plans, 2019.

Swedish Water Authorities, Heavily modified water body, https://www.vattenmyndigheterna.se/vattenforvaltning/miljokvalitetsnormer-for-vatten/kraftigt-modifierad-vattenforekomst.html Last accessed in 22/05/2023. (Last accessed 27 May 2023).

Swedish Water Authorities, RBDs https://www.vattenmyndigheterna.se/vattendistrikt.html. (Translated by the author) (Last accessed 27 May 2023).

Swedish Water Agency, International Cooperation. https://www.vattenmyndigheterna.se/vattendistrikt/bottenviken/internationell-samverkan.html (Translated by the author) (Last accessed 27 May 2023).

Swedish Water Authorities, Programme of Measures, available for download here https://www.vattenmyndigheterna.se/atgarder/atgardsprogram.html. (Last accessed 27 May 2023).

Action program for water in the North Sea Water district 2022–2027, (Åtgärdsprogram för vatten 2022—2027 Norra Östersjöns vattendistrikt) https://www.vattenmyndigheterna.se/download/18.61787693182e985d0a3270ba/1663227560029/Åtgärdsprogram%20för%20vatten%202022-2027%20Norra%20Östersjöns%20vattendistrikt.pdf (Last accessed 27 May 2023).

COM (2021) Assessment of Member States' progress in Programmes of Measures during the second planning cycle of the Water Framework Directive, Member State: Sweden.

Swedish Energy Agency, The Electricity Certificate System https://www.energimyndigheten.se/en/sustainability/the-electricity-certificate-system/ (Last accessed 27 May 2023).

The Swedish Ministry of Infrastructure, Sweden's Integrated National Energy and Climate Plan 2020 https://energy.ec.europa.eu/system/files/2020-03/se_final_necp_main_en_0.pdf

Naturvårdverket, Sweden's climate goals and climate policy framework. *(Sveriges klimatmål och klimatpolitiska ramverk)* https://www.naturvardsverket.se/amnesomraden/klimatomstallningen/sveriges-klimatarbete/sveriges-klimatmal-och-klimatpolitiska-ramverk/ (Last accessed 27 May 2023).

Norwegian Ministry of Petroleum and Energy, The Legal Framework 2019, https://energifaktanorge.no/en/regulation-of-the-energy-sector/det-juridiske-rammeverket/ (Last accessed 27 May 2023).

Norwegian Ministry of Petroleum and Energy, Guidelines for revising the licensing of watercourse regulation, *Retningslinjer for revisjon av konsesjonsvilkår for vassdrags-reguleringer*, 2012 https://www.regjeringen.no/globalassets/upload/oed/2012-0606_retningslinjer_for_revisjon_25mai_siste.pdf (Last accessed 27 May 2023).

Communication from The Norwegian Hunters' and Anglers' Association, Friends of the Earth Norway, The Norwegian Trekking Association and WWF Norway to the EFTA Surveillance Authority, Information regarding Norway's River Basin Management Plans and Programmes of Measures for 2016–2021.

Vannportalen, Tools and measures in water management DIRECTOR'S GROUP FOR IMPLEMENTATION OF THE WATER REGULATION, (Virkemidler og tiltak i vannforvaltningen, DIREKTORATSGRUPPEN FOR GJENNOMFØRING AV VANNFORSKRIFTEN) 2019. https://www.vannportalen.no/veiledere/Virkemidler-og-tiltak-i-vannforvaltningen-01.12.2020/ (Last accessed 27 May 2023).

Joint water management of the Finnish- Norwegian river basin district (2016-2021), Tana, Neiden and Pasvik catchment areas in Finland and Norway.

COMMISSION STAFF WORKING DOCUMENT European Overview - River Basin Management Plans Accompanying the document REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC) Second River Basin Management Plans First Flood Risk Management Plans

Møre og Romsdal Vannregion, Action Plan for the Møre og Romsdal Water Region 2022-2027, (Tiltaksprogram for Møre og Romsdal vassregion 2022-2027).

Norwegian Ministry of Petroleum and Energy, Energy Facts Norway, Key EU Energy Legislation https://energifaktanorge.no/en/eu-lovgivning/sentrale-direktiver-pa-energiomradet/ (Last accessed 27 May 2023).

Norwegian Ministry of Petroleum and Energy, Energy Facts Norway, Legal Sources on Renewable Energy, Norway: Overall Summary http://www.res-legal.eu/search-by-country/norway/ (Last accessed 27 May 2023).

Norwegian Ministry of Petroleum and Energy, Electricity Certificates, Https://energifaktanorge.no/en/regulation-of-the-energy-sector/elsertifikater/ (Last accessed 27 May 2023).

Norwegian Environment Agency, Renewable Energy Https://www.environmentagency.no/norwegian-environment-agency/our-responsibilities/.

Norwegian Ministry of Climate and Environment, Norway's Climate Action Plan for 2021–2030. https://www.regjeringen.no/contentassets/a78ecf5ad2344fa5ae4a394412ef8975/en-gb/pdfs/stm202020210013000engpdfs.pdf (Last accessed 27 May 2023).

APA Portuguese Environmental Agency, Portuguese Environment Agency, Lei da Água https://apambiente.pt/agua/lei-da-agua (Last accessed 27 May 2023).

COM (2021), Assessment of Member States' progress in Programmes of Measures during the second planning cycle of the Water Framework Directive, Member State: Portugal December 2021.

APA Portuguese Environmental Agency, Licenciamento, https://apambiente.pt/agua/licenciamento (Last accessed 27 May 2023).

COMMISSION STAFF WORKING DOCUMENT, Second River Basin Management Plans – Member State: Portugal Accompanying the document REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC) Second River Basin Management Plans First Flood Risk Management Plans

Portuguese National Energy and Climate Plan 2021-2030 (NECP 2030) Portugal, December 2019. https://energy.ec.europa.eu/system/files/2020-06/pt_final_necp_main_en_0.pdf (Last accessed 27 May 2023).

European Investment Bank (EIB), Tamega Iberdrola Hydropower And Storage Portugal, 2018 <https://www.eib.org/en/projects/pipelines/all/20150651>

### 6.3 Case Law

EFTA Surveillance Authority, Case No: 88013, of 17 January 2022, investigate the application of the WFD in Norway, *Information concerning WFD compliance and current Norwegian measures in place to eliminate or reduce the environmental effects of certain activities on water bodies in Norway to ensure the Article 4 WFD requirements, and other relevant requirements, are met.* https://www.eftasurv.int/cms/sites/default/files/documents/gopro/Request%20for%20Information%20concerning%20WFD%20compliance%20and%20current%20Norwegian%20measures%20in%20place.pdf (Last accessed 27 May 2023).

Case C-346/14 European Commission v Republic of Austria (2016) ECR I-322 (‘*Schwarze Sulm*’).

Case C-461/13 German Federation for the Environment and the Conservation of Nature v Federal Republic of Germany (2015) ECR I-433 (‘*Bund’*).’

EFTA Surveillance Authority, Case No: 81034, of 7 September 2022, alleged failure by Norway to comply with the WFD. https://www.eftasurv.int/cms/sites/default/files/documents/gopro/Decision%20closing%20a%20complaint%20case%20arising%20from%20an%20alleged%20failure%20by%20Norway%20to%20comply%20with%20Directive%202000_60.pdf (Last accessed 27 May 2023).

### 6.4 Online source

International Energy Agency (IEA), Hydroelectricity: Technology deep dive, Tracking report. (September 2022). https://www.iea.org/reports/hydroelectricity (last accessed 27 May 2023).

International Renewable Energy Agency (IRENA), Renewable Energy and Climate Pledges, Five Years After the Paris Agreement, 2020 p.2 & 4. <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Dec/IRENA_NDC_update_2020.pdf?rev=cdad99bc95ce4bff98ee48e157847a9f> (last accessed 27 May 2023).

International Energy Agency (IEA), Norway 2022 Energy Policy Review p.41. https://iea.blob.core.windows.net/assets/de28c6a6-8240-41d9-9082-a5dd65d9f3eb/NORWAY2022.pdf (last accessed 27 May 2023).

International Energy Agency (IEA) Portugal 2021 Energy Policy Review https://iea.blob.core.windows.net/assets/a58d6151-f75f-4cd7-891e-6b06540ce01f/Portugal2021EnergyPolicyReview.pdf (Last accessed 27 May 2023).

International Energy Agency IEA, Renewables 2022, Renewable electricity, Solar PV claims the most installed power capacity worldwide by 2027, surpassing coal, natural gas and hydropower https://www.iea.org/reports/renewables-2022/renewable-electricity (Last accessed 27 May 2023).

RES LEGAL, Legal Sources on Renewable Energy, Sweden: Overall Summary http://www.res-legal.eu/search-by-country/sweden/ (Last accessed 27 May 2023).

Iberdrola, Sistema Eletroprodutor do Tâmega, https://tamega.iberdrola.pt/projeto/ (Last accessed 27 May 2023).

EUROSTAT, EU overachieves 2020 renewable energy target, https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220119-1. (Last accessed 27 May 2023).

Environmental Protection Agency, (Vattenkraftens miljöpåverkan), The environmental impact of hydropower https://www.naturvardsverket.se/om-miljoarbetet/forskning/miljoforskning/forskningssatsningar-samhalle/vattenkraftens-miljopaverkan> (Last accessed 30 May 2023).