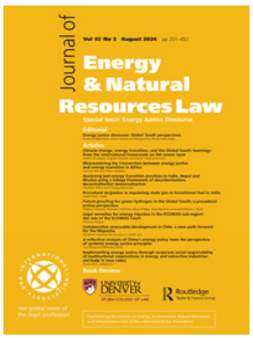

Journal of Energy & Natural Resources Law

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rnrl20

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To cite this article: Dr Kaisa Huhta, Dr Niko Soininen & Dr Seita Vesa (18 Apr 2024): The ecological sustainability of the energy transition in EU law: pro et contra hydropower, Journal of Energy & Natural Resources Law, DOI: 10.1080/02646811.2024.2331886

To link to this article: https://doi.org/10.1080/02646811.2024.2331886

Published online: 18 Apr 2024.

Journal of Energy & Natural Resources Law, 2024
https://doi.org/10.1080/02646811.2024.2331886

The ecological sustainability of the energy transition in EU law: pro et contra hydropower

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(*Received 27 November 2023; final version received 7 March 2024*)

This article explores the trade-offs in the decarbonisation of the energy sector by analysing the legal arguments in favour of and against hydropower in EU law. It contends that the EU regimes in climate, energy and environmental law each value the advantages and disadvantages of energy production in different ways. In contrasting the approaches in these three areas of EU law, the article analyses how EU law governs the decarbonisation process in the context of hydropower. The analysis reveals a promising opportunity to reconcile the friction among climate, energy and environmental law while improving the ecological sustainability of hydropower production.

Keywords: decarbonisation; energy transition; trade-offs; hydropower; EU law; conflict of laws

1. Introduction

The decarbonisation of the energy sector to mitigate climate change requires fundamental changes in the ways in which energy is produced and consumed.[1] Facilitating decarbonisation while satisfying the growing global demand for energy always involves balancing the advantages and the disadvantages of producing and consuming energy.[2] Law serves a critical purpose in steering what is a transformative process,[3] in deciding how

1 Myles Allen, 'Summary for Policymakers' in Valerie Masson-Delmotte (eds), *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty* (World Meteorological Organization 2018), 4 and 12–15

2 Francesco Fuso Nerini and others, 'Mapping Synergies and Trade-Offs Between Energy and the Sustainable Development Goals' (2018) 3 Nature Energy 10, at 10–15

3 Kaisa Huhta and Seita Romppanen, 'Comparing Legal Disciplines as an Approach to Understanding the Role of Law in Decarbonizing Societies' (2023) Transnational Environmental Law 1; Seita Romppanen and Kaisa Huhta, 'The Interface Between EU Climate and Energy Law' (2023) 30 Maastricht Journal of European and Comparative Law 45

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these trade-offs are governed and, ultimately, in determining which of the advantages and disadvantages are acceptable and which are not. However, certain legal regimes central to decarbonisation – climate, energy and environmental law – also diverge in the ways in which they govern these trade-offs, potentially creating conflicts and a need for compromises between these fields of law and, consequently, hindering effective decarbonisation.

This article analyses the trade-offs in the decarbonisation of the energy sector by exploring the legal arguments in favour of (pro) and against (contra) hydropower in European Union (EU) law. Hydropower offers an illustrative example of the multitude of trade-offs that go hand and hand with the production and consumption of energy, because it is a renewable, low-carbon source of energy and the most significant and most relied-upon source of renewable energy globally.[4] For many nations, hydropower is an indigenous energy source, improving energy independence and reducing reliance on neighbouring countries and regional and global geopolitics. Hydropower is also a stable, dependable and flexible source of electricity, as it is not weather-dependent, unlike wind or solar power. At the end of the day, it is a reliable and a secure source of energy and often an important component in balancing the intermittency of other renewable energy sources.[5] Moreover, in many parts of the world, such as Europe, the rivers most suitable for hydropower generation have already been dammed, making hydropower an operative rather than merely potential technology for mitigating climate change.[6] Notwithstanding, a considerable number of new hydropower operations are planned in Europe and globally.[7] In fact, hydropower has been cited as an energy source that will be needed in the phaseout of fossil fuels.[8] At the same time, however, hydropower production has fundamental impacts on freshwater ecology and biodiversity, both of which have already been adversely affected by human activities globally.[9] Currently, European rivers have some 21,000 hydropower dams and a considerable number

4 In 2018, hydropower generated about 15.8 per cent of the world's electricity. See International Energy Agency, Key World Energy Statistics 2020 (August 2020) <www.iea.org/reports/key-world-energy-statistics-2020> accessed 26 March 2024, 30. A caveat is needed here with regard to the low-carbon-source argument: the net total carbon emissions of the operation may vary considerably depending on eg the soil composition (whether limestone, peatland, or something else) and type of hydropower operation (eg whether run-of-the-river operation or operation based on altering river flows and storage capacity). Some research suggests that large-scale hydropower operations in particular, which are based on storing water and regulating river flows and consequently submerging land areas, can cause significant methane emissions depending on the soil type in the area. This may tilt the overall carbon balance of an operation such that it becomes carbon neutral (and not positive) or even carbon negative. See Philip M. Fearnside, 'Hydroelectric Dams in the Brazilian Amazon as Sources of "Greenhouse" Gases' (2009) 22 Environmental Conservation 7

5 Weijia Yang and others, 'Burden on Hydropower Units for Short-Term Balancing of Renewable Power Systems' (2018) 9 Nature Communications 1

6 See European Rivers Network at <www.ern.org/en/> accessed 30 October 2023

7 Christiane Zarfl and others, 'A Global Boom in Hydropower Dam Construction' (2015) 77 Aquatic Sciences 161

8 Shree Raj Shakya and Ram M Shrestha, 'Transport Sector Electrification in a Hydropower Resource Rich Developing Country: Energy Security, Environmental and Climate Change Co-Benefits' (2011) 15 *Energy for Sustainable Development* 147, at 147–159

9 Klement Tockner and others, 'Domesticated Ecosystems and Novel Communities: Challenges for the Management of Large Rivers' (2011) 11 Ecohydrology & Hydrobiology 167; CJ Vörösmarty and others, 'Global Threats to Human Water Security and River Biodiversity' (2010) 467 Nature 555; ML Thieme and others, 'Navigating Trade-Offs Between Dams and River Conservation' (2021) 4 Global Sustainability 1; European Commission, EU Biodiversity Strategy for 2030. Bringing Nature Back into Our Lives (Communication) COM(2020) 380 final, 12

of other barriers disrupting river continuity.[10] As the ecological cycle of a river depends on the free flow of water, the damming of rivers for hydropower has been one of the main drivers of the global loss of freshwater biodiversity.[11] Damming has also been found to disrupt tourism and recreational activities as well as local people's sense of place.[12] What is more, research suggests that hydropower-constructing and -producing countries have a higher rate of poverty, more internal conflict and lower economic growth rates.[13]

This article argues that EU legal frameworks in energy, climate and environmental law value these trade-offs in different ways, with these discrepancies reflected in the objectives and rationales deriving from and articulated by these legal regimes. In fact, the instruments within these regimes create incentives that sometimes simultaneously argue both for and against hydropower. EU climate law aims to increase the proportion of renewable energy sources, including hydropower, in the energy mix to ensure the achievement of climate neutrality by 2050.[14] EU energy law includes instruments to this end, but also includes measures to ensure energy security and decrease energy dependence on third countries.[15] The EU's Biodiversity Strategy 2030,[16] as well as the Nature Restoration Act in preparation,[17] establishes the objective to have 25,000 km of free-flowing rivers in the EU.[18] While the policy documents in particular present the climate, energy and biodiversity goals as mutually reinforcing rather than contradictory, in practice pursuing these aims may necessitate heavy trade-offs, as the case of hydropower governance will reveal. The resulting legal dilemmas invite questions on whether climate measures promoting renewable energy, including hydropower, should be prioritised over habitat protection and water quality – or vice versa.[19]

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10 European Environmental Agency, Recorded Hydropower Plants in Europe (7 September 2021) <www.eea.europa.eu/data-and-maps/figures/recorded-hydropower-plants-in-europe> accessed 30 October 2023; European Rivers Network, Hydropower Pressure on European Rivers. The Story in Numbers (report, 28 November 2019) <https://balkanrivers.net/sites/default/files/European%20Hydropower%20report%202019_w.pdf> accessed 30 October 2023; see also Adaptive Management of Barriers in European Rivers <https://amber.international/about/> accessed 30 October 2023

11 Günther Grill and others, 'Mapping the World's Free-Flowing Rivers' (2019) 569 Nature 215; Carolina Boix-Fayos and others, 'Effects of Check Dams, Reforestation and Land-Use Changes on River Channel Morphology: Case Study of the Rogativa Catchment (Murcia, Spain)' (2007) 91 Geomorphology 103

12 Guy Ziv and others, 'Trading-Off Fish Biodiversity, Food Security, and Hydropower in the Mekong River Basin' (2012) 109 PNAS 5609; see also Niko Soininen and others, 'Bringing Back Ecological Flows: Migratory Fish, Hydropower and Legal Maladaptivity in the Governance of Finnish Rivers' (2019) 44 Water International 321

13 Benjamin K Sovacool and Götz Walter, 'Major Hydropower States, Sustainable Development, and Energy Security: Insights from a Preliminary Cross-Comparative Assessment' (2018) 142 Energy 1074, at 1080

14 Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') [2021] OJ L 243/1, art 2

15 See in particular the RePowerEU Plan, which focuses on ensuring energy security in the energy crisis caused by the escalation of the Russo–Ukrainian War. One of the Plan's key components is to increase renewable energy production to quickly phase out Russian fossil fuels. European Commission, REPowerEU Plan (Communication) COM/2022/230 final.

16 See European Commission, EU Biodiversity Strategy (n 9)

17 European Commission, 'Proposal for a Regulation of the European Parliament and of the Council on Nature Restoration' COM/2022/304 final. The future of the Nature Restoration Law remains uncertain amid the withdrawal of support from several Member States in March 2024.

18 See Valentina Bastino, Jeanne Boughaba, and Wouter van de Bund, *Biodiversity Strategy 2030 Barrier Removal for River Restoration* (Directorate-General for the Environment 2022); Quirin Schiermeier, 'Europe Is Demolishing Its Dams to Restore Ecosystems' (2018) 557 Nature 290

19 Sanja Bogojević, 'Introduction by the General Editor. Legal Dilemmas of Climate Action' (2023) 35 Journal of Environmental Law 2

While the literature features research on the merits and pitfalls of hydropower in other fields of study,[20] the legal debate has tended to focus either on the limited perspectives of a single legal discipline, such as environmental law,[21] or on the perspectives of a single level of legal governance, such as international law or national law.[22] A more holistic approach is needed to avoid a one-sided view on the legal regimes that govern hydropower and, in a broader context, to understand the trade-offs of producing and consuming energy in the decarbonisation process. This article adopts such an approach and explains the trade-offs and legal tensions that affect renewable energy globally; more broadly, it contributes to our understanding of how law can both facilitate and restrict sustainability transitions.[23] While the conflicts between different fields of law in the energy transition can be analysed on a general level by comparing their key principles and objectives, the present focus on hydropower production offers a testbed for understanding how the conflicts between different legal fields can be reconciled in practice.

The article proceeds as follows: it first explores the EU's constitutional foundations for governing the decarbonisation of the energy sector and the functioning of hydropower in that context (Section 2). It then examines the approaches to hydropower in EU climate, energy and environmental law through a comparison of the objectives and rationales deriving from and articulated by these legal regimes (Section 3).[24] As will be demonstrated through the analysis, the obligations imposed on hydropower operators are much more concrete and detailed in EU environmental law, while EU climate law and EU energy law typically only encourage and incentivise the uptake of renewable energy more generally. Contrasting the diverging approaches in these three domains, the article goes on to analyse how EU law governs the merits and pitfalls of the decarbonisation process in the case of hydropower (Section 4). Finally, the article puts forward conclusions explaining how the friction between the three legal domains can be resolved while improving the ecological sustainability of hydropower production (Section 5).

2. The EU constitutional framework for decarbonising the energy sector

The EU's constitutional framework for decarbonising the energy sector spans policy in the areas of energy and the environment, articulated in Articles 194 and 191, respectively, of the Treaty on the Functioning of the European Union (TFEU).[25] The former article lays down the objective of promoting the development of renewable energy, while the latter gives the EU the competence to preserve, protect and improve the quality of the environment as well as to promote measures at an international level

20 See Zhong-kai Feng, Wen-jing Niu, and Chun-tian Cheng, 'Optimization of Hydropower Reservoirs Operation Balancing Generation Benefit and Ecological Requirement with Parallel Multi-Objective Genetic Algorithm' (2018) 153 Energy 706; Sovacool and Walter (n 13)

21 Soininen and others, 'Bringing Back Ecological Flows' (n 12); Suvi-Tuuli Puharinen, 'Free Rivers or Legal Certainty? Review of Hydropower Permits Under EU Water Law' (2022) 31 European Energy and Environmental Law Review 54

22 See eg Alistair Rieu-Clarke, 'Transboundary Hydropower Projects Seen Through the Lens of Three International Legal Regimes – Foreign Investment, Environmental Protection and Human Rights' (2015) 1 International Journal of Water Governance 27–48

23 See also Niko Soininen and others, 'Brake or Accelerator? The Role of Law in Sustainability Transitions' (2021) 41 Environmental Innovation and Societal Transitions 71

24 Huhta and Romppanen (n 3)

25 Consolidated version of the Treaty on the Functioning of the European Union ('TFEU') [2012] OJ C 326/47

to deal with regional or worldwide environmental problems, and in particular to mitigate climate change.

The wording of these competence provisions shows how the trade-offs between increasing the use of renewable energy and protecting biodiversity are embedded in the EU's constitutional structure. The broadly worded provisions clearly encompass the EU's role in promoting forms of renewable energy, including hydropower. Yet, with the same provisions, the EU is both empowered and obligated to safeguard biodiversity and the quality of aquatic environments; this in turn requires that the Union adopt proactive measures to prevent potential adverse ecological impacts of hydropower and other renewable forms of energy, in line with its energy and climate goals.

The management of the trade-offs called for in renewable energy activities is also divided between the EU and its member states. In practice, the competence provisions that apply to energy and environmental policy explicitly delimit the use of the EU's powers by subjecting politically sensitive policy areas, such as resource sovereignty or taxation, to unanimous decision-making or leaving decisions entirely to the discretion of the member states.[26] Specifically, unanimity – rather than the ordinary qualified majority – is required to adopt EU environmental policy measures affecting quantitative management of water resources or the availability of those resources, as well as measures significantly affecting a member state's choice between different energy sources and the general structure of its energy supply.[27] Similarly, energy policy decisions may not impact a member state's right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply.[28] Although the wording of these competence limitations is broad, they have been given a very narrow interpretation in the case law of the EU courts, in practice giving member states very restricted opportunities to successfully invoke the limitations.[29] For instance, the limitations might apply to an EU regulation designed to directly ban the use of hydropower or other energy sources, but not to a regulation limiting the use of hydropower in the interests of biodiversity.[30] Beyond these kinds of directly prohibitive measures, as in the first example, the competence limitations have little relevance in practice for the scope of the EU's energy and environmental policy.[31] On balance, then, the EU has broad policy powers to adopt legislation that applies to hydropower activities.

The EU's competence provisions are not the only constitutional norms that govern the trade-offs related to hydropower production. In some member states' constitutional traditions – such as those of Finland and, previously, also Sweden – hydropower permits have been granted on a long-term basis and, in some cases, even permanently, as many such permits date back decades.[32] In other cases, while permits may not enjoy

26 TFEU, art 192 and 194
27 TFEU, art 192
28 TFEU, art 194
29 Case T-356/15 *Austria v Commission* [2018] ECLI:EU:T:2018:439; case C-594/18 P *Austria v Commission* [2020] ECLI:EU:C:2020:742; case C-5/16 *Poland v Parliament and Council* [2018] ECLI:EU:C:2018:483
30 Case C-5/16 *Poland v Parliament and Council* [2018] ECLI:EU:C:2018:483, para 46
31 Kaisa Huhta, 'The Scope of State Sovereignty under Article 194(2) TFEU and the Evolution of EU Competences in the Energy Sector' (2021) 4 International & Comparative Law Quarterly 991
32 Soininen and others, 'Bringing Back Ecological Flows' (n 12); Puharinen (n 21) 54–67

long-term protection, efforts to remove dams on the rivers can still be difficult due to property rights and protection of the legitimate interests of the dam owners. Removal is only straightforward where the state has issued hydropower licences only for a limited time from the outset.[33] If a hydropower licence has been issued for an unlimited period of time, the facilities are typically shielded by the principles of legal certainty and legitimate expectations as well as by the constitutional right to property, which is typically enshrined not just in most member states' constitutional traditions, but also in the European Charter of Fundamental Rights.[34]

This constitutional framework functions as the foundation for governing decarbonisation in EU law. The objectives laid out in primary law are concretised in secondary law instruments enacted in the areas of climate, energy and environmental law. The section to follow delves into these domains with the aim of providing a more comprehensive understanding of the legal regimes governing hydropower and the broader trade-offs characteristic of the energy decarbonisation process.

3. Hydropower in EU climate, energy and environmental law

3.1. *Climate law*

In 2019, the European Commission introduced the European Green Deal[35] with the objective of steering the European economy towards sustainability and achieving climate neutrality by 2050. To realise the latter aim, in line with the objectives of the Paris Agreement, in 2021 the EU adopted the European Climate Law,[36] which set out the Union's legally binding commitment to reduce its net GHG emissions by at least 55 per cent. To concretise this goal, the Fit for 55 package,[37] proposed in 2021, and the RePowerEU Plan,[38] proposed in 2022, will align the EU's policies with the binding, EU-wide targets by updating and revising the EU's sectoral climate legislation, although further legislative reforms are already in sight. The process towards a 90 per cent reduction in net GHG emissions by 2040 has started, with the aim of securing pathways to reach climate neutrality by 2050.[39] Increasing the deployment of renewable energy is a central element of this contemporary decarbonisation agenda.[40]

33 For instance, limited-term (40-year) hydropower licences are used on the West Coast of the United States; see Aaron Levine and others, *An Examination of the Hydropower Licensing and Federal Authorization Process* (National Renewable Energy Laboratory 2021)

34 Charter of Fundamental Rights of the European Union [2012] OJ C 326/391, art 17

35 European Commission, The European Green Deal (Communication) COM(2019) 640 final

36 European Climate Law; The Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) 55 ILM 740

37 European Commission, 'Fit for 55': Delivering the EU's 2030 Climate Target on the Way to Climate Neutrality (Communication) COM(2021) 550 final

38 RePowerEU Plan (n 15) 1

39 European Commission, Securing Our Future. Europe's 2040 Climate Target and Path to Climate Neutrality by 2050 Building a Sustainable, Just and Prosperous Society (Communication) COM(2024) 63 final

40 Ibid., 3; for an overview of the EU Climate and Energy Framework, see eg Kati Kulovesi and Sebastian Oberthür, 'Assessing the EU's 2030 Climate and Energy Policy Framework: Incremental Change Toward Radical Transformation?' (2020) 29 Review of European, Comparative & International Environmental Law 152; Alessandro Monti and Beatriz Martinez Romera, 'Fifty Shades of Binding: Appraising the Enforcement Toolkit for the EU's 2030 Renewable Energy Targets' (2020) 29 Review of European, Comparative & International Environmental Law 225

The Renewable Energy Directive[41] is part of the Union's overarching legal structure geared to pursuing climate neutrality. It sets a common framework for promoting renewable energy and establishes a binding EU-wide target for the overall share of energy produced using renewable sources in the EU's energy consumption by 2030.[42] The directive includes various types of renewable energy, including hydropower, under the definition of 'energy from renewable sources' (ie energy from renewable non-fossil sources) but does not provide a distinct definition for hydropower.[43] The directive not only encourages the increased use of renewable energy in the EU's total energy consumption but also adopts a unified approach to different forms of renewables. Its overall design is technology neutral in that it does not prescribe which renewable energy sources should be used or prioritised. Hence, any energy classified as coming from renewable sources can be counted towards target compliance.[44] The directive has no hydropower-specific objectives or rules, nor does it lay down any other explicit provisions for it.

The designation of an energy source as renewable does not automatically imply its sustainability. The Renewable Energy Directive pays special (although not comprehensive)[45] attention to sustainability risks such as the biodiversity loss associated with the development of bioenergy and thus recognises the potential trade-offs between climate goals and biodiversity goals. For instance, the directive sets down specific sustainability criteria[46] to ensure that biofuels, bioliquids and biomass fuels that are counted towards mandatory targets or benefit from support measures are produced sustainably. However, it continues to disregard sustainability concerns related to other forms of renewable energy, such as hydropower. In particular, it does not explicitly acknowledge adverse impacts of hydropower on freshwater ecology. Then again, these seeming oversights are in line with the directive's fundamental orientation, which treats renewable energy as an instrumental solution to reducing GHG emissions.

The revised 2023 Renewable Energy Directive[47] mandates member states to establish 'renewables acceleration areas' for faster, streamlined renewable project permitting. Known as 'go-to' areas, these are designated land or sea locations ideal for renewable energy installations. Additionally, the directive considers renewable energy deployment

41 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) (the 'Renewable Energy Directive') [2018] OJ L 328/82. The provisional agreement to reinforce the Renewable Energy Directive and to agree on a new binding target of at least 42.5 per cent by 2030, but aiming for 45 per cent, was agreed in March 2023. See European Commission, European Green Deal: EU agrees stronger legislation to accelerate the rollout of renewable energy, 30 March 2023 <https://ec.europa.eu/commission/presscorner/detail/en/IP_23_2061> accessed 26 September 2023. See European Commission, European Green Deal: EU agrees stronger legislation to accelerate the rollout of renewable energy (30 March 2023) <https://ec.europa.eu/commission/presscorner/detail/en/IP_23_2061> accessed 26 September 2023. Coreper (Committee of Permanent Representatives) endorsed the final compromise text of the Renewable Energy Directive in June 2023; see Council of the European Union, 2021/0218(COD), 19 June 2023, endorsing the proposal to amend the Renewable Energy Directive.

42 The Renewable Energy Directive, art 1

43 The Renewable Energy Directive, art 2

44 Renske A Giljam, 'Implementing Ecological Governance in EU Energy Law: The Role of Technology Neutral Legislative Design in Fostering Innovation' (2018) European Energy and Environmental Law Review 241

45 Seita Romppanen, '"Blind Spots" in EU Climate and Energy Law' (2020) European Energy and Environmental Law Review 150

46 The Renewable Energy Directive, art 29

47 Council of the European Union (n 41)

an 'overriding public interest', a designation forestalling legal objections to new installations.[48] In the EU, planning and permitting challenges significantly impede renewable energy projects, often causing years of delay. However, poorly planned projects can also heighten local conflicts over land use and habitat conservation.[49] If member states choose to include hydropower installations in this list of renewables acceleration areas, the permitting processes for facilities, as well as other administrative processes used to assess their ecological impacts, will be expedited and substantially relaxed, potentially leading to the prioritisation of renewables uptake at the expense of biodiversity protection.

These kinds of trade-offs and, in particular, the potential adverse ecological effects of hydropower were recognised during the legislative process leading up to the 2023 Renewable Energy Directive. In one sign of this, during the Fit for 55 legislative process the European Parliament proposed sustainability criteria for hydropower operations.[50] The criteria would have required, among other things, that before it could be brought online, a facility would have had to implement all technically feasible and ecologically relevant measures to mitigate adverse impacts on the river as well to enhance protected habitats and species directly dependent on the waters. In addition, over 130 environmental groups urged EU officials not to classify new hydropower as renewable in the proposed update of the Directive. They pushed for the exclusion of hydropower from go-to areas and for the enforcement of strict sustainability criteria.[51] Ultimately, however, the revised directive that entered into force did not incorporate any of the proposed changes and thus fails to address the sustainability concerns related to hydropower.

As stated above, the revised Renewable Energy Directive places no restrictions on the contribution of hydroelectricity to achieving the renewable energy targets. Moreover, hydropower plants may be built in go-to (ie acceleration) areas, like those located in Natura 2000 areas, where in some cases an environmental impact assessment can be bypassed if certain conditions are met.[52] Member states are only given the possibility to exclude biomass combustion and hydropower plants (with the wording 'may exclude') from go-to areas, but no explicit incentives to push for such exclusion.[53] At the end of the day, the proposed sustainability criteria were not adopted, and the revised Renewable Energy Directive was left with a mere reference to relevant environmental legislation.[54] Ultimately, the Renewable Energy Directive's one-size-fits-all regulatory approach to renewable energy was allowed to continue, despite the growing concerns related to the adverse ecological effects of hydropower. Consequently, under the current legal framework, any measures to bolster renewable energy utilisation inherently promote the use of hydropower as long as it is defined as an 'energy from renewable sources', with no conditions limiting its exploitation.

48 Ibid 73, 91
49 RePowerEU Plan (n 15) 11
50 European Parliament, Amendments adopted by the European Parliament on 14 September 2022 on the Renewable Energy Directive, P9_TA(2022)0317
51 Letter: Counting on New Hydropower in Europe Is Irresponsible (6 February 2023) <www.wwf.eu/?8826916/open-letter-hydropower-RED-trilogues > accessed 27 September 2023
52 Council of the European Union (n 41) 82–83
53 Ibid 73
54 Ibid 22

3.2. *Energy law*

Much as increasing the share of renewable energy sources in the energy mix is a key *instrument* for achieving the objectives of EU climate law, the development of renewable energy is also a fundamental *objective* of EU energy law.[55] This goal is accompanied by three other, equally important aims relating to the functioning of the energy market, to energy security and to the interconnectivity of member states' energy markets. There is no priority among these objectives,[56] whereby pursuing the aims entails balancing these objectives and weighing trade-offs against one another.

EU energy law does not differentiate between hydropower and other renewable energy sources, let alone between large-scale and small-scale hydropower. In line with the EU's constitutional structure, member states are in principle free to choose their energy mix, and therefore to independently determine whether and to what extent they wish to rely on hydropower.[57] Several considerations circumscribe this decision: member states are bound by the obligation to achieve the Union's renewable energy targets, to ensure energy security in the electricity market[58] and to prevent, prepare for and manage electricity crises.[59] In this light, hydropower is a highly attractive option for those member states that have rivers which can be harnessed for power production, as it helps to balance the variation in the increasing production of electricity from intermittent renewable sources.[60] Therefore, the obligations arising from EU energy law create an incentive for member states to both maintain hydropower energy production and to invest in new hydropower, because it is a form of energy production that enables them to both achieve the renewable energy targets and fulfil their energy security obligations.

The incentive and pressure to maintain existing forms of energy production also emerge from private energy companies. In line with the constitutional structure of the EU, private energy companies have appealed to their right to property, enshrined in the European Charter of Fundamental Rights,[61] as well as to principles including legal certainty, legitimate expectations and investment protection.[62] In particular, the Energy

55 TFEU, art 194(1)

56 Kaisa Huhta, 'Energy Security in the Energy Transition: A Legal Perspective' in Geoffrey Wood and others (eds), *Handbook of Zero Carbon Energy Systems and Energy Transitions* (Palgrave 2022) 1–16

57 TFEU, art 194(1)

58 See eg Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast) [2019] OJ L 158/54, and Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast) [2019] OJ L 158/125, art 1

59 Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC [2019] OJ L 158/1

60 Weijia Yang and others, 'Burden on Hydropower Units for Short-Term Balancing of Renewable Power Systems' (2018) 9 Nature Communications 1; Magnus Korpås, 'Balancing of Variable Wind and Solar Production in Continental Europe with Nordic Hydropower – A Review of Simulation Studies' (2016) 87 Energy Procedia 91

61 The Charter of Fundamental Rights of the European Union [2012] OJ C 326/391, art 17.

62 On the use of these principles in EU law, see Anatole Boute, 'The Quest for Regulatory Stability in the EU Energy Market: An Analysis through the Prism of Legal Certainty' (2012) 37 European Law Review 675; Anatole Boute, 'Regulatory Stability Under Russian and EU Energy Law' (2015) 22 Maastricht Journal of European and Comparative Law 506; Kaisa Huhta, 'Anchoring the Energy Transition with Legal Certainty in EU Law' (2020) 27 Maastricht Journal of European and Comparative Law 425; Giuseppe Bellantuono, 'The Misguided Quest for Regulatory Stability in the Renewable Energy Sector' (2017) 10 The Journal of World Energy Law & Business 274

Charter Treaty protects energy investments and has been frequently invoked by energy companies in those member states that have decided to phase out the use of coal and nuclear energy to produce electricity.[63] There is no precedent for member states making a policy decision to phase out hydropower operations and thus no case-law on how such decisions might be assessed under investment law or the right to property in EU law. However, it is likely that companies would invoke similar arguments on legal certainty, legitimate expectations and the provisions of the Energy Charter Treaty if member states were to decide to phase out hydropower activities on grounds of biodiversity – particularly in light of the traditionally long-term or even permanent permits that have been granted for hydropower facilities.

3.3. *Environmental law*

3.3.1. A Birds-Eye View To EU Environmental Law Relevant To Hydropower

EU environmental law establishes multiple requirements for new and existing hydropower operations. A key aspect across the instruments is that they seek to internalise the negative ecological externalities into the price of hydropower generation and limit the ecological impact of hydropower activities to a sustainable level. In this section, we first briefly summarise the key EU environmental law instruments and their perspective in regulating hydropower generation, and then go into detail on the Water Framework Directive (WFD, 2000/60EC) as it is the most holistic instrument to this end.

Looking at the life cycle of hydropower operations from an environmental law perspective, new operations with significant impact on the environment require an environmental impact assessment (EIA) in line with the Environmental Impact Assessment Directive (2011/92/EU). The purpose of the EIA is to provide sufficient knowledge about the potential negative human and environmental impacts of new development operations (art. 3), to allow stakeholders to be informed and deliberate on the proposed project and have access to courts (art. 6, 9 and 11), and to allow the developer to consider different, less environmentally harmful alternatives for implementing the project (art. 5).[64]

After the EIA, a planned hydropower operation is required to apply a permit in which public authorities (eg WFD art. 11) consider the information provided in the EIA and deliberate on whether the proposed project is in line with EU and national environmental legal obligations. Even though legislative instrumentation and practices vary from member state to another, one aspect of such permitting is to make sure that the (hydropower) project does not cause avoidable or excess harm to the aquatic environment. Concrete legal requirements stem from various directives, such as the WFD, the Habitats Directive (HD, 92/43/EEC) and the Birds Directive (BD, 2009/147/EC). The HD and BD establish spatial and species protection measures to protect and restore biodiversity across the EU (eg HD art. 3–6 and 12–13, BD art. 3–5). Under the rules on the Natura

63 In particular, *Vattenfall AB, Vattenfall Europe AG, Vattenfall Europe Generation AG v Federal Republic of Germany*, ICSID Case No. ARB/09/6 (formerly *Vattenfall AB, Vattenfall Europe AG, Vattenfall Europe Generation AG & Co. KG v The Federal Republic of Germany*) and *Vattenfall AB and others v Federal Republic of Germany*, ICSID Case No. ARB/12/12. Both cases were settled. Germany reached an agreement between several energy utilities on financial compensation for the shut-down of both coal and nuclear activities. See also C-284/16 *Achmea* [2018] ECLI:EU:C:2018:158

64 For more information about EIA, see eg Geert van Calster and Leonie Reins, *EU Environmental Law* (Edward Elgar 2017), 130–143

2000 protection area network (HD art. 3–4), one of the cornerstones of biodiversity protection, member states are obliged to take necessary steps to protect the biodiversity of the network (HD art. 6) by management plans, permitting and other measures. All projects need to undergo a separate Natura assessment, and a hydropower project can only be permitted if, according to the assessment, it does not adversely affect the Natura 2000 protection values (HD art. 6(3)). It is possible to issue an exemption for projects that would breach those values, but in such cases there must be 'imperative reasons of overriding public interest' (HD art. 6(4)).[65]

After the project gains the required permits (including possible exemptions) to operate, it is still subject to various other requirements arising from EU environmental law. Here, it is worth mentioning that the Environmental Liability Directive (ELD, 2004/35/EC) is also relevant. According to article 3(1), the directive applies to environmental damage caused by occupational activities, hydropower among them (Annex III). The ELD refers both to the HD and the WFD in its definition of damage (ELD art. 2). The idea is to have project developers pay for the cost of rectifying environmental damage (art. 1) and to take preventive (art. 5) and remedial (art. 6) action before and after environmental damage. In hydropower contexts, such damage often refers to riverbank erosion and other negative changes caused in the river ecosystem by intermittent flow regulation.[66]

3.3.2. The WFD and hydropower

The WFD[67] establishes a systematic framework for managing the use and protection of all surface waters, coastal waters, transitional waters and groundwater in the EU. This definition – and consequently the scope of the directive – covers all rivers and is therefore applicable to hydropower activities. The directive aims at achieving good ecological status and good chemical status of all the aforementioned waters by 2015 or, failing that and contingent on exemptions, by 2021, or 2027 at the latest.[68]

All the waters in less than good ecological status are regulated by the non-deterioration clause, which requires EU member states to implement all the measures necessary to prevent the further deterioration of the water bodies and obligates them to see to it that future and existing projects do not significantly hinder the achievement of good ecological status.[69] In the seminal Weser ruling, the Court of Justice of the EU ruled that the environmental goals of the directive are legally binding on member states in the authorisation of individual projects.[70] Furthermore, the directive requires that the member states

65 See further, on hydropower in the context of Natura 2000, <www.natura2000.fr/sites/default/files/references_bibliographiques/hydro_final_may_2018_final.pdf> accessed 26 March 2024

66 See, for an in-depth analysis of hydropower in the context of the ELD, Mari Pihalehto and Suvi-Tuuli Puharinen, 'Uncharted Interplay and Troubled Implementation: Managing Hydropower's Environmental Impacts under the EU Water Framework and Environmental Liability Directives' (2023) Journal of Environmental Law 1

67 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 (the 'WFD') [2000] OJ L 327/1

68 WFD art 4.1(a)(ii); art 4.1(b)(ii). See on the time limits also Lorenzo Squintani and Helena van Rijswick, 'Improving Legal Certainty and Adaptability in the Programmatic Approach' (2016) 28 Journal of Environmental Law 443, at 461–462

69 WFD, art 4.1(a)(i) and 4.1(b)(i)

70 Case 461/13 *Bund für Umwelt und Naturschutz Deutschland eV v Bundesrepublik Deutschland* [2015] ECLI:EU:C:2015, 433

re-evaluate all the existing impoundment and other water management permits in order to close the gap between the current state of all waters in their territory and good ecological status.[71]

In the WFD system, the assessment of ecological status is primarily based on three or four biological quality elements depending on the water body in question. In the case of rivers in our hydropower context, these elements include the composition, abundance and age structure of fish fauna, among others.[72] For a river, or part thereof, achieving good ecological status with regard to fish fauna requires that only slight changes have occurred in species composition and abundance that are attributable to anthropogenic impacts.[73] Other considerations in the classification of ecological status include hydro-morphological quality elements, such as the quantity and dynamics of water flow and river continuity.[74] This means that rivers – as a default rule – should be close to their natural, pre-hydropower status by the given deadline, unless member states resort to the special classifications and exemptions made available in the WFD.

One such special classification of a river offering member states flexibility in implementing the WFD is that of 'artificial and heavily modified' due to damming and the production of hydropower.[75] When a river is so classified, the biological and hydro-morphological quality elements required are somewhat different to the default requirements of the directive. In such cases, the member state has an obligation to achieve what is known as good ecological potential, which is established by comparing the state of the river to its maximum ecological potential. As defined in the directive, good ecological potential allows only slight changes in quality elements as compared to maximum ecological potential. In practice, good ecological potential in terms of ecological quality is achievable once 'all hydro morphological mitigation measures which do not have significant adverse effects on the specified use or the wider environment' have been applied.[76] In simple terms, this means having the best possible ecological status while accepting that the economic activity (eg hydropower facility) for which the classification has been made may continue.[77]

Designating a river as an 'artificial or heavily modified' water body – and the consequent protection of economic activities on it from the full force of the WFD – is based on the idea that societally significant uses of waters should not be subject to the strictest ecological requirements if a key societal function they provide, such as energy production, conflicts with the ecological objectives. This makes it possible to reconcile the important climate, energy and environmental aspirations with the legal requirements under EU law. A pivotal limitation under the directive concerning small-scale hydropower operations is that energy production as a societal function is not evaluated for all hydropower operations individually but for the entire hydropower sector – that is, for all facilities in the member state. In line with this, the designation 'heavily modified' is typically used only in the case of mid- to large-scale hydropower operations (eg maximum installed capacity of >10 MW), which have the capacity to regulate river flow, and not in small-

71 WFD, art 11(3) and 11(5)
72 WFD, Annex V
73 WFD, Annex V
74 WFD, Annex V
75 WFD, art 2(9); 4(1) para a(iii); 4(3)
76 WFD CIS Guidance Document No. 4, 2003
77 See also Soininen and others (n 12); Puharinen (n 21) 54–67

scale (eg <5–10 MW) facilities.[78] Size is particularly important in the evaluation of whether the individual operation affects the functioning of the electricity market and energy security. Size can, however, only give a rough estimation for the designation under WFD 4(3). Other important factors are the hydro-morphological characteristics of the river (eg elevation but also the extent to which the operation has changed the hydro-morphological characteristics) and the type of hydropower technology used.[79]

Despite contextual factors affecting the size of hydropower facilities left outside the 'heavily modified' designation, what follows is that small-scale hydropower typically falls under the general – and stricter – requirement of good ecological status in the WFD as the societal benefit of small-scale operations does not warrant the rivers on which they operate being classified as 'heavily modified' water bodies. In turn, as good ecological status allows only a slight ecological deviation from the state of a naturally flowing river – hydropower dams by nature alter the river ecology more than this – small-scale hydropower operations cannot comply with the WFD requirements. Accordingly, there is a strong legal argument arising from the EU WFD for the removal of such facilities, particularly if they block the entire river channel with subsequent and profound negative ecological changes. The jury is still out, however, on whether small-scale hydropower operations could meet the requirements of WFD art. 4 by constructing natural bypasses emulating the river channel, albeit with smaller flows than the original channel. What is clear, however, is that fish stocking or engineered fish passages are typically insufficient measures to fulfil the requirements of WFD art. 4 in rivers that are subject to the good ecological status requirement and do not enjoy the protection of the 'heavily modified' designation.[80] All in all, the WFD requirements for existing large and medium-sized hydropower operations are much less intrusive than they are for small-scale hydropower.

In addition to the above classifications, the WFD contains an exemption clause that is applicable to new hydropower operations.[81] Under this clause, exemptions from the objectives of good ecological status can be justified, inter alia, by reason of overriding public interest, such as where hydropower production provides energy security and climate change mitigation. In *Schwarze Sulm* (346/14), the Court of Justice of the EU established that member states are authorised to use the exemptions for climate and energy purposes when licensing the operation of new hydropower installations. However, the use of such exemptions is contingent on there being no alternatives to

78 WFD CIS, *Steps for Defining and Assessing Ecological Potential for Improving Comparability of Heavily Modified Water Bodies*. Guidance Document No. 37 (Publications Office 2020), 13, 17 and 23; see also Tor Haakon Bakken and others, 'Demonstrating a New Framework for the Comparison of Environmental Impacts from Small- and Large-Scale Hydropower and Wind Power Projects' (2014) 140 Journal of Environmental Management 93

79 WFD CIS, *Steps for Defining and Assessing Ecological Potential for Improving Comparability of Heavily Modified Water Bodies*. Guidance Document No. 37 (Publications Office 2020), 11–12; 17–25

80 Antti Iho and others, 'Rivers Under Pressure: Interdisciplinary Feasibility Analysis of Sustainable Hydropower' (2023) 33 Environmental Policy and Governance 191. Here, it should be clarified that the sufficiency of harm minimization measures in rivers under the WFD art 4 is contingent on the hydropower activity negatively affecting particularly the biological criteria established in the directive. See also Puharinen (n 21). This assessment is not only affected by the ecological characteristics of a river, but also the hydropower generation technology used. In rivers that do not have migratory aquatic species, or in contexts where only a part of the river's fairway is blocked for hydropower generation, the WFD art 4 requirements are also looser due to reduced ecological harm caused by the hydropower activity.

81 WDF, art 4(7)

satisfy the demands for secure renewable energy deemed to be overriding public interests. Furthermore, the Directive requires that all practicable steps to mitigate the ecological harm of the new operation be taken and that measures to improve the ecological status be reviewed periodically despite the use of the exemption.[82]

4. Analysing the merits and pitfalls of EU law in the context of hydropower

The primary law provisions as well as the secondary law on energy, climate and the environment suggest that the EU legal system is not entirely internally consistent as regards the advantages and disadvantages of hydropower. In a broader sense, this means that the legal framework does not communicate consistently which of the trade-offs necessitated by the decarbonising energy sector are acceptable and which are not. This inconsistency demonstrates that law both facilitates and hampers decarbonisation and biodiversity protection, creating friction and even potential conflicts between different legal disciplines and specific legal instruments within those disciplines.[83] This competitive setting is further complicated by the polycentricity of governance within the EU: some decision-making powers, such as the right to choose between different energy sources, lie with the member states, whereas others, such as the primary competence to ensure the achievement of climate obligations, lie with the EU.

The foregoing analysis at the intersection of EU energy, climate and environmental law reveals a plurality of objectives and rationales in the governance of these three disciplines; the core drivers of these three legal domains are distinctly divergent. From the point of view of hydropower, the three legal disciplines do not agree on how the different trade-offs should be prioritised. When weighing the trade-offs associated with hydropower production in decarbonisation, two distinct considerations emerge. One pertains to the maintenance or possible phaseout of existing hydropower facilities; the other relates to the grounds or rationale for constructing new ones. Each of these raises its own set of questions of legal relevance. This is particularly visible in the case of existing small-scale hydropower operations that fall outside of the WFD's easements. Overall, hydropower as a form of energy production is cast in a different light depending on whether it is assessed under EU climate law, EU energy law or EU environmental law. The perspectives inherent in these three legal fields diverge in how they can be interpreted to encourage or restrict the maintenance of existing hydropower facilities and the construction of new ones in the context of decarbonisation efforts.

EU climate law obligates member states to reduce their GHG emissions. Among the many requirements it has imposed to this end is one mandating that member states increase the share of renewable energy production in their energy mixes. Within this legal framework, hydropower is treated as a renewable energy source that should be prioritised and increased to achieve the EU's climate objectives. EU energy law, for its part, establishes the development of renewable energy sources as an objective to be pursued through EU action and, simultaneously, requires member states to guarantee security of energy supply. While neither EU energy law nor climate law obligates

82 WDF, art 4(7); see also Puharinen (n 21)

83 On the roles of law in facilitating and restricting sustainable transitions, see Soininen and others, 'Brake or Accelerator?' (n 23); and in energy law specifically Kaisa Huhta, 'The Contribution of Energy Law to the Energy Transition and Energy Research' (2022) 73 Global Environmental Change 1

member states to choose hydropower over other renewable energy sources or to ensure security of supply through hydropower specifically, the objectives and drivers of these two legal fields make reliance on hydropower an attractive, affordable and secure solution. Therefore, these legal fields indirectly push towards reliance on hydropower.

EU environmental law has an entirely different approach. The WFD, which governs the ecological impact of existing and new hydropower activities, is structured around the protection of water bodies in Europe and the achievement of good ecological status in in those waters. Its core driver and rationale push away from damming of rivers towards unobstructed river runs and maintaining or restoring an undisturbed ecological cycle in the river, allowing the governance framework to protect and even improve freshwater biodiversity.

A prima facie comparison between the objectives and rationales of the three legal disciplines analysed here suggests an unreconcilable conflict between their objectives and rationales. However, this assessment changes radically depending on the size of hydropower installation analysed. The interactions between the three domains, and the friction between the specific interests protected by their respective norms, stand out in stark relief when the large-scale and small-scale hydropower operations are distinguished in the analysis.

The free flow of *all* rivers is not possible because of the important contribution of large-scale hydropower plants to climate change mitigation and, in particular, to balancing the electricity system, characterised as it is by an increasing share of intermittent wind and solar energy in the overall energy mix. Therefore, the focus falls squarely on smaller-scale installations – those with a capacity of 10 MW or less[84] – that contribute marginally to the climate and energy objectives but have considerable adverse effects on the biodiversity in the rivers harnessed for power. From this perspective, the arguments from EU climate law lose their cogency and persuasiveness, as the small size of the operations and disproportionately negative changes in river ecology outweigh the facilities' modest contribution to climate change mitigation.[85] The disproportionate ecological impacts of small-scale hydropower derive from the dams blocking the rivers affecting and fundamentally altering their ecology – the ideal being freely flowing waters – as crucial components (eg sediment, fish) cannot move up and down the river.[86] The same argument can be made with respect to EU energy law: the contribution of small-scale facilities to energy security and the balancing of intermittent renewable electricity is typically marginal on the level of the electricity system.[87]

This closer look at small-scale hydropower reveals a promising opportunity to improve the ecological sustainability of hydropower production, as required by EU environmental law, without compromising the legally binding objectives and obligations arising from EU climate and energy law. The EU's broadly worded competence provisions allow for a wide margin of EU action in the energy, climate and environmental policy arenas. The Union's other primary law provisions can also be interpreted to support this contention. The provisions of the Energy Charter Treaty, frequently invoked to prevent contracting states from phasing out certain forms of energy

84 WFD CIS (n 78) 13, 17 and 23; see also Bakken and others (n 78)
85 Iho and others (n 81) 198–201
86 Ibid 191–205
87 Ibid 194–95

production, only apply to foreign investment. Small-scale hydropower is typically owned by small national companies or even private individuals, whereby the phaseout of small-scale hydropower falls outside the scope of the Energy Charter Treaty. Furthermore, in the system of EU secondary climate, energy and environmental law, a phaseout of small-scale hydropower would not require radical restructuring of existing law but rather could be achieved with appropriate interpretation and effective implementation of the current legal frameworks. In large-scale operations, both existing and new, there are sufficient classification and exemption frameworks in place in the WFD to accommodate the EU's climate, energy, and environmental aspirations. For existing small-scale installations, this is not the case. Their continued operation is not imperative for the achievement of the EU's energy and climate goals. Rather, a gradual phaseout of such facilities would align with the ambitions of EU environmental law.

5. Synthesis and conclusions

This article has explored the trade-offs in the decarbonisation of the energy sector by analysing the legal arguments in favour of (pro) and against (contra) hydropower within EU law. The analysis has examined the objectives, rationales and drivers operating in EU climate, energy and environmental law in their governance of hydropower, dissected the friction and conflicts that emerge between these legal domains and, in conclusion, identified a potential avenue for improving the ecological sustainability of the energy transition.

EU law does not provide a hierarchy making it possible to prioritise the objectives and drivers within the three legal domains examined here. The effective implementation of the legal framework at large requires balancing the identified trade-offs in national contexts. A systemic analysis of the objectives and obligations arising from the disciplines suggests that while large-scale hydropower is necessary for achieving the objectives and fulfilling the obligations of EU climate and energy law, these areas of law are ambivalent with regard to small-scale hydropower, which has limited positive effects for climate change mitigation and energy security. This ambivalence reveals a promising opportunity to fully pursue the objectives of EU environmental law and the WFD through the gradual phaseout of small-scale hydropower installations.

It should be highlighted that the objectives and rationales of EU climate, energy and environmental law are not always competing or conflicting. Generally speaking, the increase in renewable energy sources is an improvement in light of the objectives of all three legal disciplines. However, as demonstrated by the findings of this article, a comparison between disciplines – particularly in a context such as hydropower – can be fruitful and, in fact, may reveal how potential friction and conflicts between different legal domains can be reconciled.[88] In fact, the article's analysis reveals a promising opportunity to resolve the friction between EU climate, energy and environmental law, while improving the ecological sustainability of hydropower production. Acknowledging a plurality of objectives and rationales can help in addressing competing forces that affect sustainable transitions and create compromises between different societal interests. While instruments for balancing the merits and perils of hydropower have been

88 Romppanen and Huhta (n 3)

suggested,[89] no wide-ranging mechanisms have been put forward for balancing the plurality of objectives within legal systems. Therefore, the question of how law should be interpreted to effectively govern the unavoidable trade-offs that emerge as a result of activities in the energy sector is the core contribution of this article.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This research was supported by the Academy of Finland (332189 and 340998) and the Strategic Research Council (358392 and 335559).

89 Zhong-kai Feng, Wen-jing Niu, and Chun-tian Cheng, 'Optimization of Hydropower Reservoirs Operation Balancing Generation Benefit and Ecological Requirement with Parallel Multi-Objective Genetic Algorithm' (2018) 153 Energy 706