

## Full Length Article

# Legal and political arguments on aquatic ecosystem services and hydropower development – A case study on Kemi River basin, Finland

Eerika Albrecht<sup>a,b,\*</sup>, Roman Isaac<sup>c</sup>, Aleksi Räsänen<sup>d</sup>

<sup>a</sup> University of Eastern Finland, Yliopistokatu 2, 80101 Joensuu, Finland

<sup>b</sup> Finnish Environment Institute (Syke), Joensuu, Finland

<sup>c</sup> Leuphana University Lüneburg, Universitätsallee 1, 21335 Lüneburg, Germany

<sup>d</sup> Natural Resources Institute Finland (Luke), Paavo Havaksen tie 3, 90570 Oulu, Finland

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## ABSTRACT

The co-production of ecosystem services (ES) is an intertwined social-ecological process in which natural and anthropogenic contributions together produce a specific ES. Despite multiple studies in which ES trade-offs have been assessed, few empirical studies on arguments for biodiversity and ES exist, in which ES co-production function as a theoretical framework. In this paper, we study the co-production of aquatic ES and analyse political and legal arguments on biodiversity and ES in a long-standing dispute over hydropower and reservoir construction in the Kemi River basin, Finland. Specifically, we investigate what kinds of representations of ES co-production can be identified from stakeholder argumentation and in legal ruling. Our data consists of 26 semi-structured interviews conducted in 2017 and again 2019 to 2020, 144 news articles, and 4 administrative court resolutions. The results show that the arguments used by the stakeholders aim at maintaining the existing hydrological regime and expanding the use of natural resources, establishing river basin management that considers the multiple uses of river, including recreation, or protecting the last untouched stretches of the river and riparian ecosystems. The analysis also reveals that what is considered a valid and effective argument for specific audiences differs for political and legal audiences. The results of this study show that ES co-production concept set emphasis on the diversity of arguments, including the arguments on biodiversity and sociocultural values, which can contribute to governance and management interactions.

## 1. Introduction

Globally, climate policy targets and the increasing demand for electricity have increased the need for renewable and affordable power supplies and resulted in a global rise of hydropower projects (Zarfl et al., 2015; Halbe et al., 2018). Hydropower projects may supply clean and affordable energy source but remain a potential source of conflict. River encroachment, for example, leads to conflicts between the riverside residents and hydropower companies, as hydropower and reservoir development impact the local culture, livelihoods, and the river's recreational and amenity values (Mustonen et al., 2010). Permanent alterations to rivers' aquatic flow regime impact aquatic biodiversity, flow and other physical parameters and rivers connectivity (Bunn and Arthington, 2002; Bavinck and Gupta, 2014; Mustonen and Lehtinen, 2021). Hydropower projects thus imply trade-offs between renewable energy supply, biodiversity, and the ecosystem services (ES) provided by

river systems, since dams and reservoirs decrease riverine connectivity and destroy terrestrial and aquatic habitats (e.g., Wieringa and Morton, 1996; Ziv et al., 2012; Soininen et al., 2019; Barbarossa et al., 2020).

Ecosystem services in regulated rivers include many provisioning, regulating and cultural services, such as electricity provision, flood control and recreational fishing (Virk et al., 2024). The ES concept has been used to respond to the global biodiversity and climate change crisis, as well as to highlight the need for nature conservation and restoration (Costanza et al., 2014; de Groot et al., 2002). Research on ES has expanded since the publication of the Millennium Ecosystem Assessment (MA, 2005) which aimed to highlight the multiple benefits of nature while recognizing the complexity of the interactions between social and ecological systems. Structural approaches to the monetary valuation of provisioning, regulating, supporting, and cultural services have been developed and remain dominant when evaluating ES (TEEB Synthesis, 2010; Haines-Young and Potschin, 2011; IPBES, 2022).

\* Corresponding author.

E-mail addresses: [eerika.albrecht@uef.fi](mailto:eerika.albrecht@uef.fi) (E. Albrecht), [roman.isaac@leuphana.de](mailto:roman.isaac@leuphana.de) (R. Isaac), [aleksi.rasanen@luke.fi](mailto:aleksi.rasanen@luke.fi) (A. Räsänen).

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Subsequently, research on ES has emphasized the need to broaden the valuation language beyond economic and ecological values (Hauck et al., 2013; Gómez-Baggethun and Martín-López, 2015; Jackson and Palmer, 2015; Comberti et al., 2015). For example, this has been done by paying more attention to the empirical analysis of the various arguments related to ES (Albrecht and Ratamáki, 2016). Political and socially constructed arguments about ecological values, cultural ES and benefits originating from ES can highlight the multiple benefits of nature and therefore support biodiversity conservation (Farber et al., 2002; Primmer et al., 2015; Hirons et al., 2016). Previous research has recognized multiple values relevant for ES such as intrinsic, instrumental and relational values (Pascual et al., 2023).

Research has expanded from the notion of nature's services to human well-being to recognising how humans influence the provision of ES via the interplay of anthropogenic and natural assets, or capitals, a process described as co-production (Lele et al., 2013; Spangenberg et al., 2014; Bennett et al., 2015; Díaz et al., 2015; Raymond et al., 2018; Cook et al., 2021; Palliwoda et al., 2021). Anthropogenic assets, also known as capitals, have been classified as human (e.g., knowledge or skills), social (e.g., institutions), physical (e.g., dams), or financial capitals (e.g., subsidies or revenue) (Palomo et al., 2016). Depending on the share of anthropogenic capitals used, the provision of ES ranges from no co-production to a high degree of co-production (Palomo et al., 2016). For example, a river's source can provide drinking water (no anthropogenic capital involvement), a river can be used to irrigate crops by pumping water to agricultural fields (low anthropogenic capital involvement), or it can be dammed to produce hydropower (high anthropogenic capital involvement). Moreover, the use of some anthropogenic capitals has been linked to trade-offs between ES (Palomo et al., 2016). Trade-offs are situations in which "management actions increase the provision of one ecosystem service and decrease the provision of another" (Felipe-Lucia et al., 2014, p. 3). For example, the use of fertilisers increases crop production but may lead to the eutrophication of water bodies if washed out.

Ecosystems, the services they provide and the anthropogenic capitals contributing to their co-production are governed by various stakeholders across governance levels (Isaac et al., 2022). While ES co-production has been studied in great detail and in various context (Kachler et al., 2023), little evidence exists on how stakeholders argue in ES conflicts and trade-off situations in which maximising one benefit might jeopardise the other (Felipe-Lucia et al., 2014; Rodríguez et al., 2006; Turkelboom et al., 2018). Thus, this paper aims to bridge between ES co-production literature and research on ES trade-offs and argues that empirical studies on ES co-production can encourage natural resource management to consider ecological and sociocultural values and adaptation to biophysical and social changes.

More specifically, we seek to understand how stakeholders perceive the co-production of aquatic ES within a river basin and how they argue in conflicts regarding ES trade-offs. Our approach contributes to understanding why and how people value biodiversity in aquatic ecosystems (Fischer and Eastwood, 2016; Vihervaara et al., 2012). Our study focuses on arguments raised in the long-standing environmental conflict regarding the Kemi River basin in Finland, which revolved around the implementation of hydropower and reservoir projects and reservoir development that impacted the co-production of various aquatic ES and have caused a prolonged political conflict with heated societal debate, and legal rulings related to it. In this study we specifically focus on the Sierilä hydropower project and the Kemihaara reservoir project. In both cases stakeholders have drawn on arguments to convince the political and legal audiences about the necessity of the respective project or justify the damage to nature caused by the project. Thus, this paper seeks to understand what kinds of co-production of aquatic ecosystem services can be identified from stakeholder argumentation in the political conflict and legal rulings on hydropower and reservoir development in the Kemi River basin.

## 2. Co-production of aquatic ecosystem services

Co-produced ES have been defined as 'the benefits from nature to people through multiple, long-term and dynamic social-ecological interactions and the associated interplay of natural and human-derived capitals' (Lavorel et al., 2020, 3). Research on ES co-production has primarily taken a landscape approach focussing on croplands, forests, and grasslands (Kachler et al., 2023), for example in agricultural settings (Malinga et al., 2018; Vialatte et al., 2019). Recent research has highlighted the importance of acknowledging the interplay of anthropogenic capitals with the natural environment for the successful management of multifunctional landscapes (Bruley et al., 2021; Henriksson Malinga et al., 2018; Malinga et al., 2018; Lavorel et al., 2020; Torralba et al., 2018). Nonetheless research on the co-production of aquatic ES exists. For example, Outeiro et al. (2017) studied how different anthropogenic inputs contribute to the provision of marine ES in various settings ranging from intensive semi-aquaculture to the wild harvesting of fish and shellfish. However, less attention has been paid to abiotic ES, hence ES solely provided by water, since abiotic ES assessments were developed later than biotic ES assessments (García-Llorente et al., 2015; Teixeira et al., 2019). Cook et al. (2021) provide an example for the interplay between anthropogenic inputs and abiotic elements by studying the co-production of ES in and around glaciers.

Here, we employ the Common International Classification of Ecosystem Services (CICES V5.1.) typology of aquatic ES, which focuses on abiotic services provided by aquatic flows and water cycles, also classified into provisioning, maintenance, and regulation and cultural services (see Appendix 1). Humans contribute to the production of ecosystem structures (Fischer and Eastwood, 2016), for example by building, and floodwalls and applying nature-based solutions in river basins.

In line with the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) framework, we lay focus on the co-production of ES as a concept since it acts as a link between ecological and social systems (Díaz et al., 2015). This is exemplified by management of aquatic ES, for example, water management practices, technological systems (the aquatic regime), and biophysical flows, as shown in our framework (Fig. 1). We draw on this framework to study the political and legal arguments showcasing the conflicting values regarding ES trade-offs and thereby impacting the governance of co-produced aquatic ES. According to Metzger et al., (2020, p. 267) ES governance "refers to the processes by which a range of actors (e.g. government, resource users, environmental groups and private entities) make decisions that influence the use of ecosystem-derived goods and services". Due to the diversity of actors involved in ES governance, a broad spectrum of arguments exists. Disentangling these can provide a better understanding of how governance affects the management of ecosystems and thus ES co-production.

## 3. Argumentation theory and audiences

Our analysis is guided by *argumentation theory* (Perelman and Olbrechts-Tyteca, 1969; van Eemeren and Grootendorst, 2004; Albrecht and Ratamáki, 2016). An argument is a linguistic unit formed in a communicative process aimed at achieving a particular result (van Eemeren and Grootendorst, 2004). In *The New Rhetoric: A Treatise on Argumentation*, Perelman and Olbrechts-Tyteca, 1969 studied the effectiveness of argumentation, which is achieved by approval from the audience. We draw on the concept of the audience, which is central for the analysis in this paper, as the argumentation targeted at political and legal audiences differs (Albrecht and Ratamáki, 2016). Here we make a distinction between political and legal audiences. Political audience encompass stakeholders involved in a political campaign while legal audience in a new rhetoric sense refers to an audience in a courtroom that needs to be convinced by a "rhetor" via the formulation of solid arguments. First, political audiences are accustomed to continuous

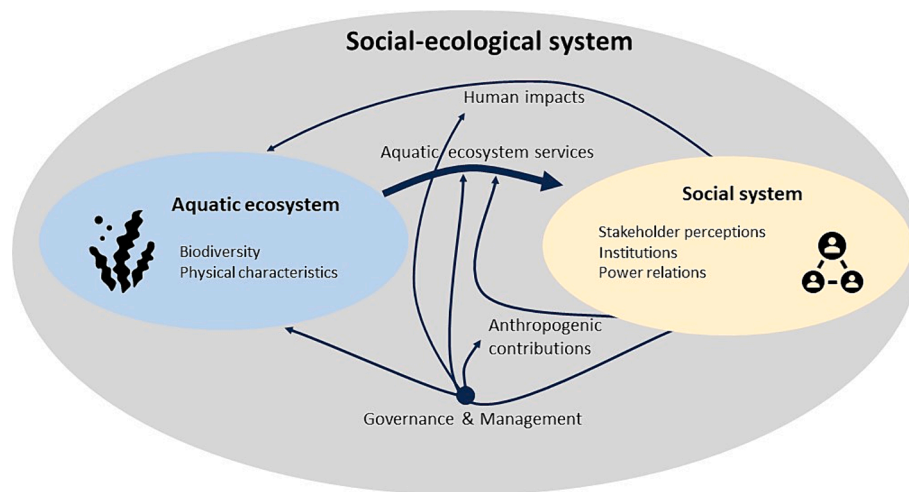


Fig. 1. ES co-production interactions between an aquatic ecosystem and a social system (Based on Díaz et al., 2015; IPBES, 2019; Martín-López et al., 2019).

conflict and discursive or argumentative struggles (Fischer et al., 2012). Therefore, politics is about contestation in the discursive or argumentative struggles over the definition and content of a policy which can be binding, for example, legislation or non-binding roadmaps or strategies. Arguments are presented throughout a discursive opening, which moves towards consensus when epistemic closure is reached. Politics is also about agency of the stakeholders, actors, or agents who take part in discursive or argumentative struggles (see e.g., Hajer and Wagenaar, 2003). Second, we refer to legal argumentation or legal reasoning as a form of communication, targeted at an audience in the courtroom or in legal texts. Legal reasoning differs significantly from critical discussion in general. For example, judges have to ensure that legal standards (such as legal certainty, legal security, and equity) are considered in respect to the rules and procedures that take place in the courtroom or in legal texts (Feteris and Kloosterhuis, 2009).

#### 4. Materials and methods

##### 4.1. Case study and context description

To have a solid analytical understanding of the various arguments presented, we study a particularly representative case of conflict related to hydropower in Finland. Finland is a post-industrial country with a high electricity consumption per capita, and hydropower constitutes approximately 15 % to 25 % of its electricity generation and 45 % of the renewables (Statistics Finland, 2021). The Kemi River is the largest river system in Finland in terms of length (522 km) and the second largest river basin in terms of area (Fig. 2, 54,831 km<sup>2</sup>) (Autti, 2013: 55, Räinen et al., 2015). It is the most regulated river in Finland, with a total of 21 power plants, which together produce one third of the country's hydroelectricity (Ashraf et al., 2016). The river flows through the towns of Kemijärvi and Rovaniemi to Bothnian Bay in the northernmost region of Finland, namely Lapland (Fig. 2). The Kemi River basin is a heavily altered aquatic ecosystem, in which the natural capital, in this case water, flows in a technological system. Thus, ES provided by the river are co-produced through financial, social, and physical (damming the river) capital (e.g., Palomo et al., 2016). Therefore, it presents a case that enables the scrutiny of trade-offs between biodiversity and a variety of aquatic ES.

Hydropower has been a source of persistent conflict and has caused the disappearance of Baltic salmon from the Kemi River, one of the most significant salmon rivers in Northern Europe (Suopajärvi, 2001; Autti, 2013). The history of hydropower and the reservoirs in the Kemi River basin dates to the World War II reconstruction period when Finland had lost its hydropower plants to Russia. In the Kemi River, the building of

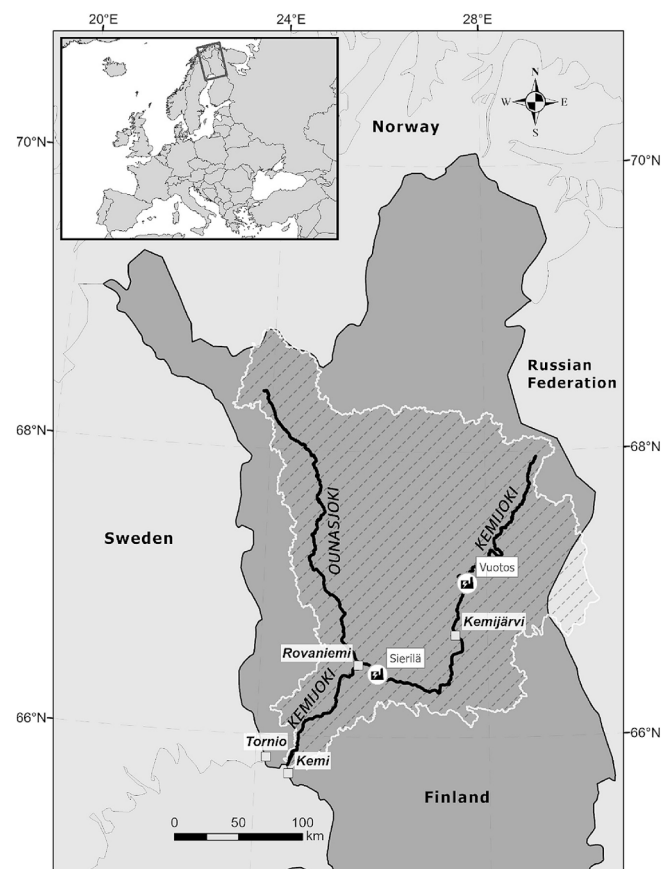


Fig. 2. Map of the Kemi River basin (© NLS, Esri Finland/cc by 4.0. Finnish Environment Institute, Esri Geoportaal Server 1.2. <http://creativecommons.org/licenses/by/4.0/>).

hydroelectric power plants started in 1944 (Alaniska, 2013). Hydropower and reservoirs in the Kemi River basin have been of interest to many studies from the sociological (Järvikoski, 1979; Suopajärvi, 2001; Autti, 2013), historical (Alaniska, 2013), geographical (Mustonen et al., 2010; Krause, 2015, 2017; Räsänen, 2021), economics (Ruokamo et al., 2024), engineering (Ashraf et al., 2018; Virk et al., 2024) and legal disciplines (Pokka, 1991). Plans to build one further hydroelectric power plant, Sierilä (The Supreme Administrative Court of Finland 2013, 2017), and the Kemihaara reservoir in the Kemi River basin have

caused decades-long environmental conflicts.

Hydropower and reservoir construction in Finland requires an environmental permit, the granting of which is based on the balancing of interests where ‘benefits should override the damage’, according to the Finnish Water Act (587/2011); in other words, the societal and economic benefits of a hydropower operation must outweigh the harms. Until the 2000 s, the benefits did override the damage, almost without exception. Recently, the ecological values (e.g. Farber et al., 2002) have been gaining ground, as the EU environmental regulation has imposed stringent criteria for the review of existing permits. The Water Framework Directive (WFD), article 4 sets the objective of achieving good ecological status of European waters and promotes the non-deterioration principle (Feichtinger and Pregernig, 2016; Abazaj et al., 2016). Hydropower capacity in Finland can only be increased in rivers with existing hydropower plants because of the existing legal framework (Soininen et al., 2019; Similä et al., 2022). Most of the rivers have already been built for hydropower generation, and the remaining free-flowing rivers are legally protected.

The Kemi River serves as a good case to study the co-production of aquatic ES, because of the heated societal debate, the prolonged political conflict, and the legal rulings related to hydropower and reservoir development. For one, we focus on the environmental conflict around the Sierilä hydropower project, in which stakeholders draw on various arguments to convince the political and legal audiences about the necessity of the project or to justify the damage to the environment caused by the project. The Sierilä hydropower project received an environmental permit in 2017 while a construction permit and an exemption from the land use plan remained pending (The Supreme Administrative Court of Finland, 2017). Ultimately, the hydropower company, Kemijoki Oy, decided not to build the hydropower plant, mainly due to economic reasons (Yle 5 January 2024). Second, we take the Kemihaara reservoir project into consideration. The project was ruled out by the Finnish Supreme Administrative Court in 2019 but was constantly debated before the decision. Taking the Kemihaara project into consideration complements the analysis of the Kemi River basin, as it predominantly draws on water retention and flood risk management as main arguments.

#### 4.2. Data collection and analysis methods

This study is based on the case study approach (Yin, 2009). Case study research allows for the combination of multiple sources of data in a form of data triangulation. Our data stem from semi-structured interviews conducted in 2017 and between 2019 and 2020 (26 in total; Table 1), as part of two individual postdoctoral projects, news material from the archives of the Yle National Broadcasting Company (143 in total), water permit decision (Regional State Administrative Agency, 2011) and court rulings from the Vaasa Administrative Court (2012) and the Supreme Administrative Court, Finland (The Supreme Administrative Court of Finland, 2013, 2017a, 2017b). The semi-structured interviews were conducted with water governance stakeholders of the Kemi River basin responsible for flood risk management, hydropower development, land use planning, or active in civil society (see Table 1). In the first round of interviews, we focussed on flood risk management in Kemi River basin and in the second round on the Sierilä hydropower project. The interviewees were different each round. All interviews were recorded and transcribed, permission for which was obtained at the beginning of the interviews.

**Table 1**  
The types and numbers of interviewees.

Type of interviewee	2017	2019–2020	Total
Residents	6	4	10
NGOs	2	3	5
Regional administration	8	3	11

To identify what kinds of aquatic ES stakeholders recognize (Table 2 and Appendix 2), we used the CICES Version 5.1 (CICES, 2022, <https://www.cices.eu>; Haines-Young and Potschin, 2011, 2018). We applied the abiotic ES template of CICES Version 5.1., which has recently been amended to include abiotic services, to classify the aquatic ES in the Kemi River basin. Even though the CICES classification is a comprehensive classification system also covering abiotic flows, relatively few assessments are based on aquatic ES (van der Meulen et al., 2016). We use the ES co-production lens to study the aquatic flow regime which allows us to scrutinise how hydropower and reservoir development alter the free-flowing water into ES stocks and flows that can be commodified in the form of electricity in hydropower production. We used this approach to demonstrate how a long-standing environmental conflict, in which arguments for biodiversity have been used, has evolved.

Because of the long-standing environmental conflict, our analysis focused on the administrative process to follow how the arguments evolved and how new arguments are being sought. We coded arguments in the data using Atlas.ti V8.1 (2021). Within the coding, we followed abductive reasoning, in which ES co-production theory was operationalized to interpret the argument categories. Based on our framework (Fig. 1), we grouped the arguments according to whether they were in favour of hydropower development (co-produced abiotic aquatic ES), based on ecological values (ecosystem), based on social-economic values (social system), or based on procedural aspects (governance and management). We also assessed whether the arguments were targeted at political or legal audiences to understand the role of different audiences in prolonged environmental conflicts. We assessed which ES category the arguments represent and how they link to the ES co-production.

**Table 2**

Examples of co-produced aquatic ecosystem services in the Kemi River basin identified from the research data.

Section	Division	Group	Service in Kemi River basin
Provisioning (abiotic)	Water	Surface water used for nutrition, materials, or energy	Hydropower
		Other aqueous ecosystem outputs	Snow, ice
Regulation & Maintenance (abiotic)	Regulation of physical, chemical, and biological conditions	Regulation of baseline flows and extreme events	Regulation of floods and droughts
		Mediation of nuisances of anthropogenic origin	Regulation & Maintenance (abiotic)
Cultural (Abiotic)	Transformation of biochemical or physical inputs to ecosystems	Physical and experiential interactions with natural abiotic components of the environment	Canoeing, hiking, skiing
		Intellectual and representative interactions with abiotic components of the natural environment	A rowing event organized by a civil society organization
	Indirect, remote, often indoor interactions with physical systems that do not require a presence in the environmental setting	Spiritual, symbolic, and other interactions with the abiotic components of the natural environment	‘Cultural trauma’, identity
		Other abiotic characteristics that have a non-use value	Science, education

## 5. Results

### 5.1. Co-produced aquatic ecosystem services in the Kemi River basin

Our assessment of interviews, legal documents, and news articles has led to discovering a variety of ES provided by the Kemi River basin. These range from provisioning ES, such as energy production, to the regulation of floods, and finally cultural ES (e.g., [Hirons et al., 2016](#)) in the form of recreational activities. For a full list of ES found in the Kemi River basin see [Table 2](#).

### 5.2. Sierilä hydropower project

We studied the prolonged environmental permit procedure between 2011 and 2020. Political and legal arguments for and against the Sierilä hydropower project are summarized in [Table 3](#) (the complete list of arguments can be found in [Appendix 2](#)). We classified the arguments into four sub-categories: those in favour of the hydropower project; those based on the damage to ecological values; those based on the damage to living environments, recreation, and livelihoods; and those based on procedural aspects. In this section, we derive a timeline of events in the Sierilä hydropower project development and indicate what kinds of arguments are related to the different phases of the project.

Initially, the environmental conflict over the Sierilä hydropower project started when an environmental impact assessment was conducted in 1999 and the project subsequently entered the regional land use plan in 2001. The CEO of the Kemijoki Oy hydropower company commented on the project in the national news by presenting arguments for the project: *'We are pleased that a permit process that lasted six years has received a positive decision. This is the first hydropower project in the new millennium'* (Yle, 31 May 2011). At the same time arguments emphasizing the project's natural damages were raised in the Finnish media. The Finnish Association for Nature Conservation (FANC) commented on Yle news report that *'alongside the nature directive species blunthead sandwort and Capricornia boisduvaliana, other conservation values in the area are difficult to give an economic value, and therefore balancing the interests cannot be considered as just'* (Yle, 6 June 2011).

Kemijoki Oy applied for the water permit required by the Water Act from the Regional State Administrative Agency of Lapland in 2005. Since the enactment of the Water Act (264/1964), most projects causing changes to water bodies, including hydropower plants, were required to obtain a water permit. This implied more careful planning and justification of hydropower projects. The agency granted a permit in 2011, as hydropower plants were treated as a standard procedure in which balancing benefits and damage is central ([Regional State Administrative Agency, 2011](#)).

According to the permit resolution, the benefits of hydroelectricity production overrule the major impacts on ecological values and living conditions of the area ([Regional State Administrative Agency, 2011](#)). The decision's argument was based on the economic value of hydropower in a river basin that had previously been degraded by several other hydropower projects. The decision also acknowledged that the significance of ecological values had recently increased in society and listed damages caused to public health, conservation values, and the local population. The resolution noted that building the dam would have an impact on the landscape and nature. The project would threaten several habitats of different types, some of which endangered, and endangered species of vascular plants which inhabit the area. Examples of these are the Lapland buttercup (*Ranunculus lapponicus*) and the blunthead sandwort (*Moehringia lateriflora*), which are Annex IV species according to the EU Habitats Directive (92/42/EEC). These species are strictly protected across the EU ([Council of the European Communities, 1992](#)). The riverbanks were found to be the only habitat of *Capricornia boisduvaliana*, which is likely to become extinct in Finland due to the project ([Välämäki and Itämies, 2002](#)).

In 2011, the FANC, along with residents and other stakeholders,

appealed to the Vaasa Administrative Court, which is the mid-level administrative court where environmental permit appeals are heard. In the Finnish Administrative Court system, several rounds of appeals can be made. Thus, issuing a final permit might take up to a decade (see [Fig. 3](#)). The Vaasa Administrative Court overruled the granting of a permit referring to the overall damage to nature, and since no permit had been granted to make an exception to nature conservation ([Vaasa Administrative Court, 2012](#)). Kemijoki Oy, along with three other stakeholders, appealed to the Supreme Administrative Court when the permit conditions were tightened.

The Supreme Administrative Court returned the issue to the Vaasa Administrative Court. The reasoning for this resolution was based on procedural aspects which the Vaasa Administrative Court should consider further, including whether the permit for making an exception to the nature conservation should have been retrieved from the Regional Centre for Economic Development, Transport and Environment, Lapland before the permit resolution (Supreme Administrative Court, 2013). Hence, as one of the interviewees commented: *'And in the permit conditions, it is stated, that the permit for making an exception to nature conservation is required and they haven't conducted it [...] and when you go to an obvious location, which is typical for Lapland buttercup and blunthead sandwort, you always find something.'* (Interview 10).

A total of 50 appeals were made to the Vaasa Administrative Court (2015). Many of these were waterfront residents requesting compensation, fisheries management requesting compensation for lost fishing grounds and damage caused to crayfish populations, and the Finnish Association for Nature Conservation demanding further consideration of conservation values according to Finnish and EU legislation. The Vaasa Administrative Court performed an inspection in the Kemi River basin. *'... all who appealed are allowed to speak ...'*, a judge ruling on the case commented (Yle, 25 August 2014).

The latest environmental permit resolution was granted in 2017 by the Supreme Administrative Court (2017b). In this resolution, biodiversity trade-offs were debated widely in legal and societal contexts ([Similä et al., 2022](#)). The Water Framework Directive played a significant role in the reasoning, as the ruling required consideration of the water management plan for the Kemi River basin from 2016 to 2021. A preliminary ruling by the European Court of Justice in the Weser Case, C-461/13 (*Bund für Umwelt und Naturschutz Deutschland vs. Germany*), outlined that the directive is applicable to individual projects. According to the Supreme Administrative Court, the water quality objectives are legally binding and were therefore applicable to the Sierilä hydropower project. The lower parts of the Kemi River are already classified to merely be in satisfactory status due to the loss of ecological connectivity in a regulated river system, which is why permission for further deterioration should not be granted.

Meanwhile, the movement to prohibit the building of the Sierilä hydropower plant attracted wide societal attention ranging from residents and holiday-house owners to a small number of Finnish political and academic elite. Non-governmental organizations (NGOs) such as the World Wildlife Fund (WWF), the FANC, the Finnish Federation for Recreational Fishing (FFRF), the Reindeer Herders Association, the Finnish Nature League, Greenpeace, and Birdlife organized a petition against the hydropower project. The WWF representative commented on Yle news: *'It is a place with significant natural values. We see that the construction of Sierilä hydropower plant would be a major loss for biodiversity in Finland'* (Yle, 30 November 2017). The FANC organized a rowing event, amongst other things, between 2017 and 2019 to show their discontent with the hydroelectric dam project:

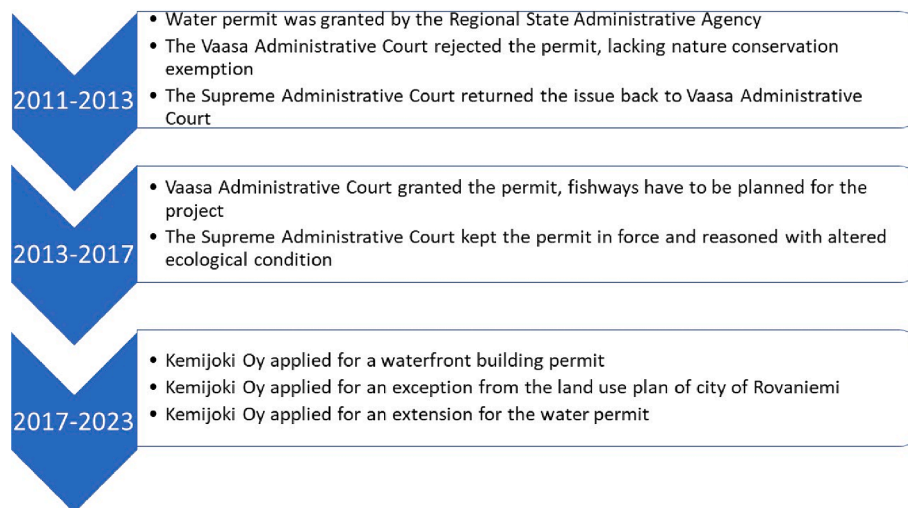
*It wasn't a citizen movement of a thousand people, but of tens. The first row attracted most people, and the next three rows that had been organized, fewer. So about 50 people in total. Not everyone had the time to stay both days, as it was a two-day event from Vanttauskoski to Oikarainen.* (Interview 9)

To date the environmental conflict is still ongoing, as construction of

**Table 3**

Main arguments, how they relate to the political and legal audiences, which type of ES they are categorized and how they link to the ES co-production framework in Sierilä hydropower project. The full list of arguments is presented in [Appendix 1](#).

Category	Argument	Audience	ES category	ES co-production linkage
In favour of the project	'Climate change increases the amount of water in the Kemi River basin'	Political	Provisioning	Social-ecological system
Ecological values	'Hydropower is a clean, renewable source of energy'	Political	Provisioning	Social-ecological system
	'The hydropower plant would destroy the habitats of the Lapland buttercup and bluntleaf sandwort'	Legal	Biodiversity	Ecosystem
Living environments, recreation, and livelihoods	'The riverbanks are the only habitat of <i>Capricornia boisduvaliana</i> '	Legal	Biodiversity	Ecosystem
	'The hydropower plant would cause damage to the local communities'	Political	Cultural ES	Social-ecological system
Procedural aspects	'The landowners would lose their land'	Political	Cultural ES	Social-ecological system
	'The permits for exemption from nature conservation were not applied'	Legal	Biodiversity	Governance & management
	'A construction permit is required'	Legal	Provisioning	Governance & management



**Fig. 3.** The permit procedure for the Sierilä hydropower project.

the Sierilä hydropower plant requires a construction permit and exemption from the municipal land-use plan. The FANC, among others, made further appeals against Kemijoki Oy's construction permit and claimed that the company had failed to fulfil the permit conditions.

Hydropower is also used as balancing power to strike a balance between electricity production and consumption. The transition to climate neutrality is increasing the demand and required capacity of balancing power, and hydropower producers refer to government plans ([Finnish Government, 2019](#)) to achieve climate neutrality by 2035 to justify the Sierilä hydropower project. The numerous arguments demonstrating the damage to nature and the living environment and livelihoods have influenced the public, although they have not been able to mobilize a mass movement.

### 5.3. The Kemihaara reservoir

The Kemihaara reservoir project, originally named the Vuotos reservoir project, has been one of the most remarkable environmental conflicts in Finland ([Suopajärvi, 2001](#)). The Vuotos case comprises a historical set of administrative court rulings in Finnish water law, because a water permit in terms of Article 2(6) of the Finnish Water Act for a dam or reservoir had never been rejected.

In September 1992, Kemijoki Oy applied for a water permit from the Water Court of Northern Finland ([Koivurova, 2004](#)). The Vaasa Administrative Court reasoned in its decision in 2001 that, because of social change, what was applicable in the 1960 s was no longer applicable and thus rejected Kemijoki Oy's application for a water permit. The case of the Vuotos reservoir was closed in 2002 by the [Supreme](#)

[Administrative Court \(2002\)](#), which ended the legal battle at that point. The [Supreme Administrative Court \(2002\)](#) reasoned with the change towards the recognition of ecological values in a regulatory environment and community law and upheld the decision of the Vaasa Administrative Court. According to [Koivurova \(2011\)](#), the adaptivity of law is visible in the reasoning of the Finnish administrative court system, as community law and strengthening environmental standards have altered the regulatory environment. The change in societal values also reflect the experience of building the Lokka and Porttipahta reservoirs in 1960 s and the massive damage caused to the Sámi population, local communities, and nature ([Järvikoski, 1979](#); [Mustonen et al., 2010](#)).

Political interest in building the reservoir remained and resulted in new arguments being sought. Almost a decade later, the project was relabelled as Kemihaara reservoir project ([Fig. 4](#)), and when political arguments were needed, it was argued that the project was needed for flood risk management: '*And then here are some other people, who think that the reservoir should be built. One argument for that has been this flood risk management in recent years*' (Interview 8).

During the interviews, material arguments, both for and against the reservoir, were presented but the debate did not include such a diversity of arguments as in the case of Sierilä (see [Table 4](#)). Flood risk management was used as an argument both to build more reservoirs and for hydropower. The project was debated in the Yle news in 2011, as a green party representative commented: '*... flood risk management is useful societal risk management, but it cannot be achieved by destroying nature conservation areas*' (Yle, 19 January 2011).

Once again, the administrative court system of Finland functioned as the arena for a long-standing environmental conflict. The plan to build

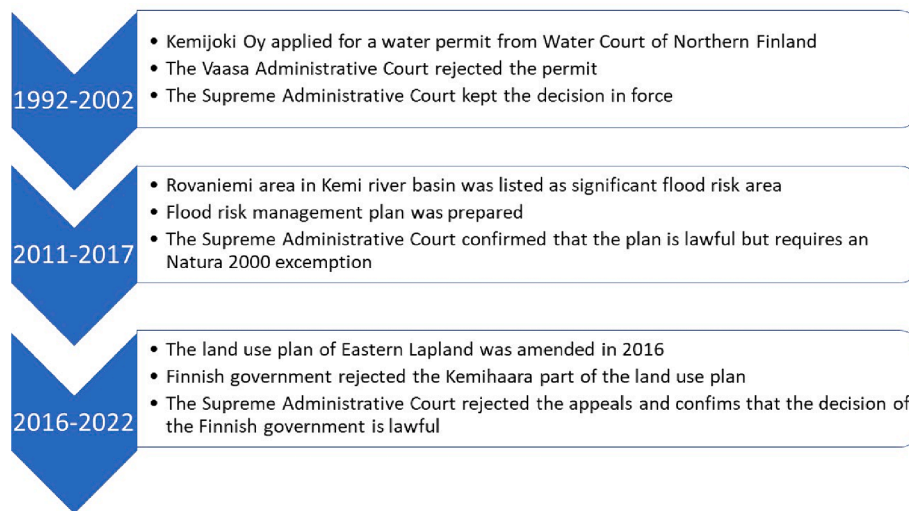


Fig. 4. The Kemihaara reservoir project in the Finnish Administrative Court system.

Table 4

Main arguments, how they relate to the political and legal audiences, which type of ES they are categorized and how they link to the ES co-production framework in Kemihaara reservoir project. The full list of arguments is presented in Appendix 1. The full list of arguments is provided in Appendix 1.

Category	Argument	Audience	ES category	ES co-production linkage
In favour of the project	'Preparedness for floods that occur every 250 years will be improved'	Political	Regulating	Social-ecological system
Ecological values	'The Kemihaara reservoir should not be built because of the damage to conservation values'	Political and legal	Biodiversity	Ecosystem
	'The Kemihaara reservoir should not be built because of the attempts to return the European beaver to the area'	Political and legal	Biodiversity	Ecosystem
Living environments, recreation, and livelihoods	'The project would impact cultural heritage'	Political and legal	Cultural	Social system
	'The project would impact agriculture and forestry'	Political and legal	Provisioning	Social-ecological system
Procedural aspects	'The project requires Natura 2000 assessment and exemption'	Legal	Biodiversity	Governance & management
	'When conducting the flood-risk management plan assessment, relevant legislation, previous assessments and administrative court rulings should have been considered'	Legal	Provisioning	Governance & management

the Kemihaara reservoir was integrated into the flood-risk management plan for 2016–2021 in the Kemi River basin in 2016 (Kemijoen Tulvayrhmä et al., 2016). According to the flood-risk management plan, the main aim of the project was to prepare for flood events that occur every 250 years. The flood-risk management plan resulted in a round of appeals to the Finnish Administrative Court system (see Fig. 4). Some of the stakeholders argued that it would be enough to prepare for floods that occur every 100 years and that it was tendentious to argue for flood measures to prepare for floods that occur every 250 years (Supreme Administrative Court, 2017a). The Supreme Administrative Court confirmed that the plan was lawful, although it reasoned that the reservoir could not be built in a Natura 2000 area<sup>1</sup> without an exemption, since it was planned to be within the Kemihaara mires Natura 2000 site, and thus required an impact assessment to obtain the exemption.

The plan was also integrated into the proposal for the land-use plan of Eastern Lapland, which would amend the land-use plan that entered into force on 26 October 2004. Like the flood-risk management plan, the reservoir project proposal for the land-use plan required a Natura 2000 exemption, as the land-use plan had to be accepted by the Finnish government. The government did not accept the land-use plan with respect to the part that proposed the plan to build the Kemihaara

reservoir. One of the interviewees commented: 'In the Rovaniemi–East Lapland land use plan, the Kemihaara reservoir was considered for flood-risk management, but it was mainly in the Natura 2000 area ...' (Interview 5). The Finnish Government declined the permit, so that the Kemihaara reservoir could not be planned in a Natura 2000 site, and the land-use plan entered into force on 21 September 2022 (Lapin Liitto, 2022). Due to the flood risk assessment and preparations for floods which occur every 250 years, the reasoning in this case was based on procedural aspects. The language used in these processes is overly technical and the administrative procedures are lengthy, which is why such prolonged environmental conflicts can be emotionally exhausting for the activists. One activist commented to Yle news: 'It is the sense of injustice that forced me into action' (Yle, 24 September 2017).

## 6. Discussion

This paper looked at political and legal arguments based on co-produced aquatic ES in a conflict on hydropower and water retention. We argue that co-production concept can serve as a tool to emphasize the multiple interactions within the social-ecological system by illustrating the arguments that favour specific forms of co-production. In our analysis, political and legal arguments related to hydropower and reservoir development emphasized both the supply and demand of co-produced ES and related to their governance and management. In line with Bruley et al., (2021) who found that research can unravel synergies,

<sup>1</sup> Natura 2000 is a Europe wide network of sites protected under the European Union's Birds (79/409/EEC) and Habitats Directive (92/43/EEC).

trade-offs, and feedback between NCP, quality of life and beneficiaries in the co-production of NCP, our analysis revealed how diverse arguments target these governance interactions in long-standing environmental conflicts on distribution of natural capital.

Since ES co-production is based on the interplay of natural capital and multiple anthropogenic capitals, the concept can illustrate the diverse arguments connected to the use of each of these capital types. For one, arguments related to biodiversity and sociocultural values can support governance to be responsive to the changes in the social-ecological system. Similarly, Felipe-Lucia et al. (2015) noted that integrating ecological and social systems and ES interactions can shed light on power asymmetries between natural resource management and foster the sustainable management of ES. We remain critical about the potential of such new concepts in governance to solve long-standing environmental conflicts. Concepts, although they are offering fascinating lenses on the world, have a limited capacity to capture the world. Yet, they can function as lenses that simplify the world and open arenas for interdisciplinary discussion (Díaz et al., 2015). ES research needs to develop new ways of highlighting the value of biodiversity and ecosystem functions to recognize the diversity of arguments, including those based on the intrinsic value of nature and sociocultural values. Dissecting specific value types that are underlying drivers of conflicts could be beneficial to improve ES governance.

The arguments for co-produced ES aim at maintaining power structures that support the current aquatic regime of hydropower and reservoirs (e.g., Mustonen and Lehtinen, 2021; Swyngedouw, 2015). On one hand, these are based on the economic value of hydropower, on the other hand, they emphasize the flood-risk management benefits of the Kemihaara reservoir. Arguments concerning the ecological and social systems are mostly against hydropower development. They are based on avoiding biodiversity loss and repairing damage done in the past. These arguments are based on the ecological or intrinsic value of nature (Farber et al., 2002; Davidson, 2013), or against the loss of livelihoods and cultural ES (Hirons et al., 2016). Many of the latter stem from the cultural trauma (Autti, 2013) created by the power asymmetries during the hydropower construction in the river basin. In addition, some of the arguments promote adaptiveness within the water governance system, as climate, society, and the regulatory environment inevitably keep changing. Others are targeted to maintain the political campaign (Albrecht and Ratamäki, 2016).

Arguments based on procedural aspects targeted mostly the legal audience (the administrative court system) in terms of the water licensing procedure under the Finnish Water Act. However, legal arguments also included other types of arguments for and against ES co-production of aquatic ES. The stakeholders in the Sierilä case referred to multiple ecological values in the area, listing threatened EU Habitats Directive Annex V species and arguing for the recreational value of the river basin. We recognise that arguments on the Kemihaara reservoir were based on flood-risk management and procedural aspects, such as when developing the flood-risk management plan, the relevant legislation, previous assessments, and administrative court rulings should have been considered. Arguments were also based on ecological and social values, such as forestry and agricultural land and cultural heritage sites. Earlier research discussed that the main reasons for constructing the Kemihaara reservoir were not related to flood-risk management as such, but to the desire to have the reservoir (Räsänen et al., 2020). It has even been proposed that the lobby for the reservoir and subsequent dispute over flood defence measures have hampered the preparedness for floods and increased mistrust of the authorities among local residents (Räsänen, 2021).

Previous research has shown that the FANC, among other stakeholders of the local environmental movement, has been appealing to the Finnish Administrative Court system as a form of strategic litigation (Albrecht and Ratamäki, 2016). In the Finnish permit system, the economic value of electricity is typically weighed over the river ecosystem's biodiversity and cultural values. This creates a problem of valuing co-

produced ES over biodiversity since economic value is often considered more important than other values related to nature and biodiversity in management contexts. Biodiversity and many ESs are typically not attributed any monetary value, although studies and methods exist to attribute monetary value to changes in biodiversity and ES (Ruokamo et al., 2024). Plurality of values should be considered in environmental management when aiming for transformative change (Pascual et al., 2023). For example, the objective of achieving good ecological status in European waters and the so-called non-deterioration principle within the WFD, guides the balancing of hydropower and ecological values. This has shifted the weight within the Finnish administrative court system towards the recognition of ecological values (Koivurova, 2011).

Similarly, the focus of managing aquatic resources has shifted towards river restoration and dam removal to return part of rivers' ecological potential. The Kemi River's ecological connectivity has been lost, thus, the building of fishways has been suggested as a solution to improve the ecological conditions (Soininen et al., 2019). Political pressure and changing permit conditions might favour ecological restoration of the Kemi River but may provoke opposition from the public. Reintroducing migrating fish and creating functioning fishways would be significant in terms of conservation efforts for the salmon populations of the Baltic Sea, which are already threatened by climate change and water pollution (Varjopuro et al., 2014). In addition, river basin restoration in co-operation with the hydropower producer, regional authorities, and residents would return part of the river's ecological characteristics, support the ecosystem-based adaptation, and foster resilience of the social-ecological system (Cosens, 2010; Doswald et al., 2014).

While our study has investigated diverse arguments from various sources it has some limitations regarding the case study approach and use of framework in its qualitative analysis. First, the case study approach is limited in its potential to generalize results. The approach aims at an in depth understanding of an often place-based phenomenon. Therefore, the data has only limited potential to explain phenomena outside the given context. Second, our study only investigates arguments in a conflict on the co-production of aquatic ES rather than the co-production itself. Thus, further research could investigate how arguments favour the co-production of ES and how specific capitals are supported by certain arguments. Third, we acknowledge that the ES co-production concept falls short of recognizing other than one-way interactions within the socio-ecological system. For example, concept of services to ecosystems would also recognize the human contribution to the well-being of ecosystems (Comberti et al., 2015).

## 7. Conclusions

This paper studied the role of arguments and audiences in ES co-production in aquatic ecosystems in the Kemi River basin, which has been an arena of long-standing environmental conflict. We classified abiotic aquatic ES in the Kemi River basin and studied the political and legal arguments for and against hydropower and reservoir development. We examined the Kemi River environmental conflict as a process in which stakeholders draw on arguments to convince political and legal audiences about the necessity of a project or justify the damage to nature caused by the project. Our analysis revealed the context-specific arguments aiming to convince political and legal audiences about the benefits of, and damages caused by, the Sierilä hydropower project and the Kemihaara reservoir. The arguments were based on the value of co-produced ES, ecosystem values, social and cultural values, and management and procedural aspects. We found two strands of arguments targeting political audiences. For one, those aimed at maintaining the existing hydrological regime and expanding the use of natural resources. Second and in contrast, those aimed at protecting the last remaining parts of the river and the riparian ecosystem. Moreover, we found arguments originating from the administrative and legal systems related to civil law, such as the Finnish environmental permit systems scrutinized



in this article. Whilst suitable arguments for political and legal audiences differ in this regard, our research has shown that political structures and legal norms define what will be considered a valid argument, and which values will be handled in policy or legal processes. Thus, further research is needed on how this affects citizens' participatory rights and the legitimacy of the decisions made by the administrative court system. Studies on the co-production of ES should hence place more emphasis on governance and management interactions that affect the interlinkages between ecological and social systems.

### CRedit authorship contribution statement

**Erika Albrecht:** Writing – original draft, Methodology, Conceptualization. **Roman Isaac:** Writing – original draft, Conceptualization. **Aleksi Räsänen:** Writing – review & editing, Methodology, Conceptualization.

### Appendix 1

Section	Division	Group	Class	Service in Kemi River basin
Provisioning (Abiotic)	Water	Surface water used for nutrition, materials or energy	Surface water for drinking	Surface water for drinking
Provisioning (Abiotic)	Water	Surface water used for nutrition, materials or energy	Surface water used as a material (non-drinking purposes)	Surface water for non-drinking purposes
Provisioning (Abiotic)	Water	Surface water used for nutrition, materials or energy	Freshwater surface water used as an energy source	Hydropower
Provisioning (Abiotic)	Water	Ground water used for nutrition, materials or energy	Ground (and subsurface) water for drinking	Ground water for drinking
Provisioning (Abiotic)	Water	Ground water used for nutrition, materials or energy	Ground water (and subsurface) used as a material (non-drinking purposes)	Ground water as source of energy
Provisioning (Abiotic)	Water	Other aqueous ecosystem outputs	Other	Snow, ice
Regulation & Maintenance (Abiotic)	Transformation of biochemical or physical inputs to ecosystems	Mediation of waste, toxics and other nuisances by non-living processes	Dilution by freshwater and marine ecosystems	Dilution by atmosphere, freshwater and marine ecosystems
Regulation & Maintenance (Abiotic)	Transformation of biochemical or physical inputs to ecosystems	Mediation of waste, toxics and other nuisances by non-living processes	Mediation by other chemical or physical means (E.g., via Filtration, sequestration, storage or accumulation)	Mediation of waste, toxics and other nuisances, by natural chemical and physical processes
Regulation & Maintenance (Abiotic)	Transformation of biochemical or physical inputs to ecosystems	Mediation of nuisances of anthropogenic origin	Mediation of nuisances by abiotic structures or processes	Mediation of nuisances by hydropower and reservoirs
Regulation & Maintenance (Abiotic)	Regulation of physical, chemical, biological conditions	Regulation of baseline flows and extreme events	Mass flows	Mediation of flows by natural abiotic structures
Regulation & Maintenance (Abiotic)	Regulation of physical, chemical, biological conditions	Regulation of baseline flows and extreme events	Liquid flows	Regulation of floods and droughts
Regulation & Maintenance (Abiotic)	Regulation of physical, chemical, biological conditions	Regulation of baseline flows and extreme events	Gaseous flows	Gaseous flows in water cycle
Regulation & Maintenance (Abiotic)	Regulation of physical, chemical, biological conditions	Maintenance of physical, chemical, abiotic conditions	Maintenance and regulation by inorganic natural chemical and physical processes	Maintenance of physical, chemical, abiotic conditions, e.g water quality
Cultural (Abiotic)	Direct, in-situ and outdoor interactions with natural physical systems that depend on presence in the environmental setting	Physical and experiential interactions with natural abiotic components of the environment	Natural, abiotic characteristics of nature that enable active or passive physical and experiential interactions	Canoing, hiking, ski-doing
Cultural (Abiotic)	Direct, in-situ and outdoor interactions with natural physical systems that depend on presence in the environmental setting	Intellectual and representative interactions with abiotic components of the natural environment	Natural, abiotic characteristics of nature that enable intellectual interactions	Row organized by the eNGO
Cultural (Abiotic)	Indirect, remote, often indoor interactions with physical systems that do not require presence in the environmental setting	Spiritual, symbolic and other interactions with the abiotic components of the natural environment	Natural, abiotic characteristics of nature that enable spiritual, symbolic and other interactions	“Cultural trauma”, identity
Cultural (Abiotic)	Indirect, remote, often indoor interactions with physical systems that do not require presence in the environmental setting	Other abiotic characteristics that have a non-use value	Natural, abiotic characteristics or features of nature that have either an existence, option or bequest value	Science, education

### Appendix 2. Arguments on co-production on ES in Kemi River basin

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

Data will be made available on request.

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Arguments	Political	Legal
<b>FOR SIERILÄ HYDROPOWER PLANT</b>		
Sierilä hydropower plant should be built because... (26 in total)		
...climate change increases the amount of water in Kemi River basin	x	
...there will be more water, why don't we use it?	x	
...hydropower is clean renewable source of energy	x	
...hydropower is green energy	x	
...there will be more jobs and income	x	x
...there will be more tax revenues	x	x
...hydropower can minimize the flood risk	x	
...climate change is increasing the flood risk	x	
...how would you go to sauna, if there weren't hydropower plants?	x	
...more hydropower is needed for the bioeconomy	x	
...the hydropower company produces electricity to the benefit of its shareholders	x	
...the company is the biggest hydropower producer in Finland	x	
...hydropower is regulating power, which can balance the peaks in energy production and consumption	x	
...in boreal regions the CO2 emissions of hydropower are low	x	
...hydropower supports the climate neutrality targets	x	x
...it would balance the water flow	x	x
...it would increase the clean hydropower production	x	
...it would reduce the distance between Vanttaus and Rovaniemi power plants	x	x
...the distance between the hydropower plants would be optimal	x	
...the project has more benefits than damage	x	x
...the efficiency of the hydropower system would increase	x	
...it would improve the winter-time hydropower production	x	
...when the society needs much electricity on Monday morning for example then hydropower is needed	x	
...the recreational use of the river would improve	x	x
...the conservation values have not as much value than the electricity	x	
...the benefits can be calculated in kilowatt hours	x	
... Kemi River and Kitinen hydropower projects parallel with Sierilä project		x
...of the principle of legal certainty: previous hydropower projects have been permitted, without an exception		x
Sierilä hydropower plant should not be built because...	x	x
<b>FOR KEMIHAARA RESERVOIR</b>		
Kemihaara reservoir should be built because...		
...preparedness to floods that occur every 250 years will be improved		
...in 1859 and 1910 great floods have reached that flood heights	x	
...the health risk to the population living in the flood risk zone has not been considered	x	x
...EU flood directive requires climate risk assessment		x
<b>ARGUMENTS BASED ON DAMAGE TO ECOLOGICAL VALUES (Sierilä)</b>		
...it destroys the river ecosystem	x	x
...river becomes a lake	x	
...the water level rises	x	x
...it destroys habitats of fish species	x	x
...European otter ( <i>Lutra lutra</i> ) habitats would be lost	x	x
...Bank swallow ( <i>Riparia riparia</i> ) habitats would be lost	x	x
...Lapland buttercup ( <i>Ranunculus lapponicus</i> ) habitats would be lost	x	x
...Bluntleaf sandwort ( <i>Moehringia lateriflora</i> ) habitats would be lost	x	x
...the riverbanks are the only habitat of <i>Capricornia boisduvaliana</i>	x	x
...Green snake tail ( <i>Ophiogomphus Cecilia</i> ) habitats would be lost	x	x
...European crayfish ( <i>Astacus astacus</i> ) habitats would be lost	x	x
...freshwater pearl mussel habitats are destroyed	x	x
...Tervakari and Tikkasenkari rocks are lost	x	x
...small streams are lost	x	x
...small islands are lost	x	x
...the sand dunes and riverbanks are lost	x	x
...the ice formation is damaged when the hydropower plant is built	x	x
...climate change should not be dealt with so that the biodiversity loss increases	x	
...the water has to flow free	x	
...the migratory fish should be returned	x	x
...the ecological condition should be returned	x	
...11 species of endangered vascular plants		x
...endangered moss species		x
...5 km <sup>2</sup> of land area would be covered by water		x
...19 relics would be covered by water		x
<b>ARGUMENTS BASED ON DAMAGE TO ECOLOGICAL VALUES (Kemihaara)</b>		
Kemihaara reservoir should not be built because...		x
...of the damage to conservation values	x	x
...impact on soil		x
...impact on surface and ground waters		x
...climate impacts		x
...impacts on the flora and fauna		x
...the area has several nature protection sites		x
...the attempts to return the European beaver to the area	x	
<b>ARGUMENTS BASED ON DAMAGE TO LIVING ENVIRONMENTS, RECREATION AND LIVELIHOODS (Sierilä)</b>		
...it causes run-off	x	x
...last remaining free flowing part of Kemi River will be lost	x	
...one should be more concerned about the nature than about how many people have a job in Lapland	x	

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(continued)

Arguments	Political	Legal
<b>FOR SIERILÄ HYDROPOWER PLANT</b>		
...it would cause a local ecocatastrophe in the area	x	
...building of the dams was the biggest ecocatastrophe in the Northern-Europe	x	
...in other parts of the world hydropower plants and dams are deconstructed	x	
...the fluctuations of water level increases	x	
...it would destroy the fishing grounds	x	
...it would cause damage to the local communities	x	
...the landowners lose their land	x	
...it changes the scenery	x	x
...there is no possibility to swim in the river	x	
...the hydropower company is against fishways	x	
...local people have been pressured by the company in the past, it has not many friends	x	
...the hydropower plant would damage the conservation values and nature conservation	x	
...it causes damage to the holiday house owners	x	
...it causes damage to the agriculture	x	
...it causes damage to the living environments	x	
...it causes damage to the recreational use	x	x
...the hydropower company does not fulfil the permit requirements	x	
...of the dam safety	x	
...of the activists and residents organized a row	x	
...it is a beautiful place	x	
...it is nice to go canoeing there	x	
...there are hollow groves on the riverbanks	x	
...the tourism should be able to invest	x	
...a dike would be built, which splits a cape in half	x	
...the Sierilä area should be left as it is	x	x
...mercury concentration in fish rises		x
...wells and springs stay under water		x
...it causes erosion		x
...the project would impact 6 villages		x
...the project would impact 81 buildings		x
...the project would impact water traffic		x
...the project would impact livelihoods, such as reindeer herding, agriculture and tourism		x
...the project would impact water pipelines and drainage		x
...the project would impact traffic		x
...the project would impact internet and electricity lines		x
...the nature tourism image of the region is damaged		x
<b>ARGUMENTS BASED ON DAMAGE TO LIVING ENVIRONMENTS, RECREATION AND LIVELIHOODS (Kemihäärä)</b>		
...the project would impact human health	x	x
...the project would impact cultural heritage	x	x
...the project would impact agriculture and forestry	x	x
...the project would impact hunting and fishing	x	x
...the project would impact nature products	x	x
<b>ARGUMENTS BASED ON THE PROCEDURAL ASPECTS (Sierilä)</b>		
...a construction permit is required	x	
...the neighbours were not sufficiently informed about the plans for landfill area	x	
...the permits for exemption from nature conservation were not applied	x	
...the land use plan needs to be updated	x	
...the exemption for building at the waterfront needs to be applied	x	
...transplantations of the protected species are required	x	
...digging is prohibited during the nesting season of bank swallow	x	
...the test fishing required in the permit conditions should be done	x	
...the test hatch of the fish eggs as required in the permit conditions should be done	x	
...the plans were not publicly available during the public hearings for the land use plan	x	
...the city council needs to vote on the land use plan	x	
...the project is too expensive for the company	x	
...the company needs to apply for an extension for the water permit	x	
...the nature investigations are outdated	x	x
...the compensations are low	x	x
...the company has controlled the broadcasting about the project	x	
...the technology-centred views control the society	x	
...somebody must be on nature's side	x	
...the fishways should be required	x	x
...in Vuotos-case significant changes in environment and aquatic environment and its functions changes was a reason to decline a permit		x
...Vuotos-case has shown that environmental values have gained momentum in society		x
...the good achievable water status of the river basin management plan for 2016–2021 is deteriorated		x
...the decision must be overruled		x
...the company need to protect the riverbanks, the boatyards and tree-cover		x
...the constitution and national laws must be respected		x
...inspection should be renewed		x
...full compensations should be paid		x
...water quality targets according to Water Framework Directive should be considered		x
...Nature Directive and Birds Directive targets should be considered		x
...significant changes to natural condition and aquatic environment should be considered as stated in the Finnish Water Act		x
...the environmental impact assessment is outdated		x
...an order to plant rainbow trout is needed		x

(continued on next page)

(continued)

Arguments FOR SIERILÄ HYDROPOWER PLANT	Political	Legal
...compensations for the loss of recreational values are needed		x
...a request for EU preliminary ruling was made		x
ARGUMENTS BASED ON THE PROCEDURAL ASPECTS (Kemihäara)		
...the project requires Natura 2000 assessment and exemption		x
...in the Natura assessment plans that are illicit should not be assessed	x	
...this kind of interlinkages of administrative processes does not fit to good governance principles		x
...the issue should return to flood management group so that the disqualified persons don't take part to allow unbiased decision making		x
...the objectives should be set so that they are possible to achieve in the implementation phase of 2016–2021 of flood management plan		x
...in the environmental assessments the reservoirs haven't been assessed according to good governance practices		x
...the ministry hasn't governed and monitored the flood risk management group so that it would consist of stakeholders that are capable of objective decision making		x
...when conducting the flood risk management plan, relevant legislation, previous assessment and administrative court rulings should have been considered		x
...the flood risk management actions haven't been coordinated with the water quality objectives		x
...the project should fulfil the criteria to make an exemption to the water quality objectives		x
...even the so-called common good is no reason to make an exemption to the water quality objectives		
...the project has impacts on Bothnian Bay, which is why Swedish authorities should be informed		x
...the flood risk management plan should prepare for floods that occur every 100 years	x	x
...the plan has not considered higher floodwalls in the above lake as an alternative		
...the flood risk management actions haven't been coordinated with the birds and habitats directive objectives		x
...the has not informed the stakeholders about the course of the project	x	x

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