

The ecosystem services concept as a tool for public participation in management of Poland's Natura 2000 network



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ABSTRACT

This paper examined how the ecosystem services (ES) concept was employed as a tool for stakeholders from different social and professional worlds to deliberate about the management of Natura 2000 areas in Poland. Drawing from Framing Theory and discourse analysis, we analyzed public documents that were generated over a five-year period. We observed that many public debates were couched within the ES framework and related to management of a range of land cover categories. Our results also indicated the majority of public discussions were descriptive and neutral, with a focus on maintaining the flow of *Provisioning*, and *Regulation and Maintenance* services to local communities. Normative tones were adopted, particularly surrounding *Cultural ES*, despite the limited amount of time that stakeholders dedicated to exploring these topics. Our results reinforce the importance of considering the ES concept as a boundary object that maintains interpretive flexibility and focuses stakeholder attention on points of potential social conflict. The implications that emerge from this research are particularly relevant for protected areas, such as those found in Poland, which are reforming environmental protection plans and seeking communication tools to facilitate public participation, environmental sustainability, and more equitable policy outcomes.

1. Introduction

The ecosystem services (ES) framework has gained attraction over the last two decades given its potential to provide a common basis for valuing the environment (Costanza et al., 2017, 1997; de Groot et al., 2012; Hein et al., 2006; McDonough et al., 2017; Oikonomou et al., 2011; Richards et al., 2017). Although academics and practitioners have directed their attention to incorporating multiple values into decision-making (Fisher and Brown, 2014), there remain inconsistencies in how these values are interpreted and applied (Brown, 2013; van Oort et al., 2015). In particular, instrumental, intrinsic and relational views of nature rest on divergent premises that are increasingly recognized and necessarily maintained by decision-makers (Kenter, 2016; Chan et al., 2016). The ES concept offers one unifying platform for acknowledging and incorporating these different views of human-nature relationships into environmental policies (Chan et al., 2016; van Riper et al., 2017b). A host of frameworks have been developed to aid in this process (Muhar et al., 2017), including the Millennium Ecosystem Assessment (MEA, 2005), The Economics of Ecosystems and Biodiversity

(TEEB, 2010), Common International Classification of Ecosystem Services (Haines-Young and Potschin, 2013), and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (Díaz et al., 2015). Although the tenets of these frameworks differ, they converge on the assumption that people obtain benefits from ecosystems and classify ES into the categories of *Provisioning* (e.g., food), *Regulation and Maintenance* (e.g., climate regulation), and *Cultural services* (e.g., recreational experiences).

Previous research has argued that the ES framework can be considered a “boundary object” that enables people to integrate knowledge across social and professional worlds (Abson et al., 2014; Schröter et al., 2017; Steger et al., 2018). Running in parallel to this conceptualization is the idea of a “bridging concept” (Braat and de Groot, 2012; Davoudi et al., 2012; Paehlke, 2005) that links different disciplines (Deppisch and Hasibovic, 2013) and provides a common language for bringing theory into practice within interdisciplinary teams (Baggio et al., 2015). This body of work suggests ES can become a tool for standardization that is flexible enough to adapt to local needs and constraints, and sufficiently robust to maintain a common identity across diverse

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stakeholder groups (Star and Griesemer, 1989). Interpretive flexibility is an important precondition for ES to continue functioning as boundary objects and/or bridging concepts, because implementation is often guided by diverse organizational and communication needs in society (Primmer and Furman, 2012). That is, collaborators must ensure their priorities and conceptualizations remain sufficiently vague but operational and specific in local contexts (Star, 2010). This research approach is particularly useful for trade-off situations when there is need to balance the costs and benefits of diverse human uses of ecosystems (Deng et al., 2016; Howe et al., 2014).

Poland constitutes an interesting case for analyzing the ES concept given the extent of scientific discussions that have focused on this topic since 2000 (Maczka et al., 2016; Maczka and Matczak, 2014; Mizgajski et al., 2014; Piwowarczyk et al., 2013; Stępniewska et al., 2017). Despite the concept's presence in European Union (EU) policies, it rarely appeared in Polish legal documents prior to the XXI century (Maczka et al., 2016). Because of rapid socio-economic transitions (e.g., moving from central planning to a market-based economy, increased numbers of NGOs and democratization of decision-making) in Poland over the past 25 years, environmental policies have undergone substantial changes (Cent et al., 2014; Kluvánková-Oravská et al., 2009; Niedziakowski et al., 2015; Sasse et al., 2006). Those changes included the implementation of the Nature Conservation Act in 1991 and its reformation in 2004 that defined the goals and forms of nature-based settings (e.g., national parks), as well as created channels of cooperation with non-governmental organizations. Similar to other Central and Eastern European countries, Poland has been criticized for weak institutional capacity (Jänicke, 2002) and, consequently, its public participation has slowly developed (Grodzinska-Jurczak and Cent, 2011). The adjustment of Poland's legal and administrative framework after the fall of Communism in 1989 and the EU accession in 2004 resulted in transposition and implementation of EU regulations, which impacted the current shape of Polish environmental policy and governance (Grodzinska-Jurczak and Cent, 2011; Guttenbrunner, 2009). A prime example of these changes is the EU-wide Natura 2000 network that was implemented in Poland to advance biodiversity conservation.

Our study explored how the ES framework was employed by stakeholders to advance economic, environmental and land use policies and practices during deliberation of the Natura 2000 network, which is the world's largest network of protected areas. Specifically, we examined how the ES concept was used by stakeholders engaged in the processing of this public policy in Poland (García-Nieto et al., 2015; Sarkki and Karjalainen, 2015). Building on previous research about the implementation and mainstreaming of ES (de Groot et al., 2010; Sarkki and Karjalainen, 2015), we applied discourse analysis of secondary data (Hajer, 1995) and drew on Framing Theory (Borah, 2011) to analyze multi-stakeholder communication about management of Natura 2000 areas. We explored how the ES framework functioned as a participatory tool by relating the ES categories to discussions and negotiations about management of protected areas (i.e., Natura 200 sites) in Poland. Our assessment of stakeholders' interests unveiled points of potential social conflict, and provided insight on the process of weighing tradeoffs across different land cover categories across Poland. This is the first investigation of how ES frames are employed in environmental policy discourse at a nation-wide planning and management scale in Poland. Therefore, the primary purpose of this study was to understand how the ES concept was implicitly present in stakeholder deliberation on resource management topics in Poland. The following three objectives guided this investigation:

1. Determine the extent to which different ES categories appeared in discourse about management plans in Poland;
2. Assess whether ES were useful to represent both descriptive and normative aspects of biodiversity conservation;
3. Examine how different stakeholder groups interpreted ES frames across land cover categories.

2. Review of previous research

2.1. Policy context for the application of ecosystem services

The ES concept has been applied in a variety of contexts and is widely recognized as integral to assessments of natural capital from local to global scales (Guerry et al., 2015; UNESCO, 2013). At an international scale, EU policies have directly engaged with the ES framework (Bouwma et al., 2017) to solve problems tied to: 1) water efficiency (e.g., Blueprint to Safeguard Europe's Water Resources); 2) biodiversity (e.g., an EU biodiversity strategy to 2020); 3) agriculture (e.g., Common Agricultural Policy towards 2020); 4) marine management (e.g., Marine Strategy Framework Directive); 5) forests (e.g., the new EU forest strategy); and 6) invasive alien species (e.g., EU Regulation 1143/2014 on Invasive Alien Species). The ES concept has also been incorporated into environmental policies at national scales (Hansen et al., 2015; Maczka et al., 2016; Molnar and Kubiszewski, 2012; Nordin et al., 2017; Pittock et al., 2012; Sitas et al., 2014) and local levels (Hansen et al., 2015). Particularly in Poland, although the ES framework is rarely at the forefront of national policy documents (Maczka et al., 2016; Mizgajski et al., 2014), it has been indirectly applied at the local level in contexts such as coastal cities (Piwowarczyk et al., 2013).

Public involvement in the formation of environmental policies requires decision-makers to recognize the diverse array of stakeholder values and positions that are expressed through descriptive (i.e., neutral) and prescriptive (i.e., positive and negative) messages (Schmidt, 2008). Although the vast majority of discourse is descriptive, public policies can become contested over time (Bouwma et al., 2017), especially when they are based on prescriptive communications across sectors and competing interest groups (de Groot et al., 2010). Given that public consultation can be steeped in misunderstandings and distortion of concepts (Kraft and Furlong, 2012) alongside social conflict (Maestre Andrés et al., 2012; Sarkki and Karjalainen, 2015), the co-production of knowledge through participatory and deliberative processes becomes paramount for sustaining a dialogue (Wüstenhagen et al., 2007). This requires that agencies use accessible language (Albrecht and Ratamáki, 2016) and include stakeholders throughout all phases of the decision-making process (Setten and Brown, 2018), particularly during discussions about controversial topics such as risk communication (Atman et al., 1994; Renn, 2008; Slovic, 2016), climate variability (Jamieson, 2014; Markowitz and Shariff, 2012; Myers et al., 2012; Nisbet, 2009), and land management concerns in protected areas (van Riper et al., 2017b).

There is value in implementing and mainstreaming the ES framework in public policies (Cowling et al., 2008; Maczka et al., 2016; Pittock et al., 2012); however, previous research has indicated this is a challenging process (Bouwma et al., 2017). Particularly in terms of EU policies (Kabisch, 2015) the extant literature has showed that informal strategies focused on planning for urban green space in Berlin (e.g., Urban Development Concept 2030) referred to the ES concept in 2015 yet stakeholders remained unaware of the ES term. The study of climate protection laws in Germany also showed both biotic and abiotic ES were a significant part of the landscape planning domain. In Poland, legal acts concerning the protection of ecosystems (Stępniewska et al., 2017) showed that ES were incorporated into regulations in 2015, albeit indirectly and not in harmony with executive regulations. These challenges suggest that policies are increasingly widening the scope of protection from preservation to the protection of ecosystem functions. Yet, even using the ES concept *de facto* does not require high public awareness of the concept.

2.2. Natura 2000 as a biodiversity conservation policy

Natura 2000 is a form of nature conservation in the EU focused on species and habitats. Based on EU directives, the main aim of Natura

2000 is to ensure the long-term survival of Europe's most valuable and threatened organism and places. The EU Member States are responsible for employing conservation authorities to manage these spaces. Cooperation is required for authorities, voluntary bodies, local or national charities and private landowners, with the purpose of providing effective resource protection (Alphandery and Fortier, 2001; Bryan, 2012; Hiedanpää, 2005; O'Donnell and Stokowski, 2016). Management plans are the preferred option for most EU Member States to facilitate decisions about particular Natura 2000 areas (Cernecky, 2011). The two models of Natura 2000 legal frameworks include national legislation in countries such as the Netherlands that require provinces to set up management plans for each Natura 2000 area, and management approaches in countries such as Germany that do not have legal mandates but instead rely on legislation from the Special Areas of Conservation and Special Protection Areas. Although Natura 2000 was established within the conservation paradigm but not in response to the ES framework, the framing of benefits provided by ecosystems to human communities is increasingly applied in Natura 2000 governance.

In Poland, management plans have legislative support at the national level. In accordance with the art. 28 par. 1 of Act of 16 April 2004 on Nature Conservation, the Polish Parliament appoints a supervisor of particular Natura 2000 areas (e.g., Regional Director of Environmental Protection, Director of Maritime Office for marine areas). The first draft of the management plan is required within six years of the approval of an area by the European Commission or the appointment of a special protection area. It is approved by an act of local law in the form of an order of the Director of the Regional Directorate for Environmental Protection. Establishing a management plan is mandatory, except for marine areas or the areas that already have a pre-existing protection plan from a national park or a nature reserve (Journal of Laws of the Republic of Poland from 2015, item 1651). Developing a management plan includes identifying risks for a Natura 2000 area and actions that should be carried out by particular entities. The method and scope of management tasks for Natura 2000 were defined in the Ordinance of the Minister of Environment dated 17th February 2010 (Journal of Laws of the Republic of Poland from 2015, item 1651). Management plans included protection tasks such as required descriptions and boundary maps, identified threats to plant and animal species and their habitats, objectives, and protective measures and monitoring.

Given the scale and scope of the Natura 2000 network (it covers ca. 18% of the EU territory), conflicts have emerged throughout its establishment and management. To mitigate these conflicts, facilitated communication and public participation measures have been widely applied (Bouwma et al., 2016). Similar to other countries, difficulties were experienced during the implementation of Natura 2000 areas in Poland. The participation of local communities in the implementation process was limited only to information and education, sometimes after key decisions were made (Bołtromiuk, 2012). This “announce and defend” model (Yosie and Herbst, 1998) raised concerns over social and environmental justice. Consequently, a concerted effort was made to rectify public exclusion from decision-making.

2.3. Application of discourse analysis and framing theory

Discourse analysis is one approach for investigating how stakeholders articulate and engage with the ES frame. Discourse is defined as “a specific ensemble of ideas, concepts, and categorizations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities” (Hajer, 1995, pp 44). Frames refer to the context of language and images (Borah, 2011; Druckman, 2001), as well as the broader structures and ideas that can be discerned from communication (Kemp et al., 2017). Frames emerge from “persistent patterns of cognition, interpretation, and presentation, of selection, emphasis, and exclusion” (Gitlin, 1980 pp 7). According to Goffman (1974), frames are embedded within discourse and are schemata for interpreting events. Drawing

from the Common International Classification of Ecosystem Services V4.3 (CICES) (Haines-Young and Potschin, 2013) we defined the ES framework as the representation of reality that reflected environmental concerns connected with services from ecosystem affecting human well-being.

Discourse analysis and particularly Framing Theory have been applied in previous research to better understand an array of socio-environmental issues such as shale gas (Clarke et al., 2015; Lis and Stankiewicz, 2016; Vuola and Pyhälä, 2016), natural disasters (Ashlin and Ladle, 2007), and conservation policy (Spash and Aslaksen, 2015). This theoretical lens has also been applied to better understand how parts of reality were made more salient in communication about resilience (McGreavy, 2016) and the role of new technologies to create memes for environmental protests (Davis et al., 2016). In ES-related research, it was applied by Bieling (2014), who conducted a hermeneutical in-depth analysis of stakeholders' short stories and Asah et al. (2014) in an analysis of focus group interviews. However, previous research has yet to draw on Framing Theory to better understand how stakeholders articulate ES in environmental policy discourse at a nation-wide scale.

3. Material and methods

Drawing on the literature reviewed above, we examined the framing of ES concepts at multiple Natura 2000 areas across Poland, and conducted a discourse analysis (Fairclough and Fairclough, 2013; Wodak and Krzyzanowski, 2008) to identify the contexts in which the ES categories appeared. Specifically, we used mixed methods (Graneheim and Lundman, 2004; Hsieh and Shannon, 2005; Krippendorff, 2004) to analyze notes from meetings about management of Natura 2000 areas in Poland. Content analysis was performed using a predefined set of categories that reflected the ES frame, and we focused particular attention on public policy consultations that provided information on the use of ES in a variety of land use contexts (Kabisch, 2015).

3.1. Research material

Individual notes from meetings were examined to determine how the ES frame was used as a launching point for discussion among stakeholders. Management plans typically move through a 21-day public consultation period. However, in response to the historical process for public engagement in decisions about the implementation of Natura 2000 areas in Poland, the General Directorate for Environmental Protection extended the consultation process in 2009 by organizing a series of meetings for stakeholder deliberation. Meetings were organized by the Directorate and notes containing the course of the meeting were taken. These meetings were held in venues such as local cultural centers, headquarters of local departments of National Forest Holding, and National or Landscape parks. Although attendance was not always high, securing participation of stakeholders was one of the primary concerns of organizers (General Directorate for Environmental Protection, 2016).

In total, we collected 1,077 notes (4,475 pages) from 15 out of 16 provinces of Poland created from 2010 to 2015. The Mazowieckie province denied access to their data. These documents varied in length from 1 to 47 pages ($M = 4.16$). The average amount of discussion time was four hours. The details in documents varied, though these documents largely maintained similar structures, including the date, title, list of participants in attendance, and the discussion.

3.2. Research procedure

The analytical procedures adopted in this study spanned four phases that were carried out from May 2015 to January 2017. Phase 1 focused on selecting research material to be included in the analysis given the importance of working with high quality and relevant information. Two

Table 1
Description notes from public consultation meetings concerning preparation of management plans in Natura 2000 areas in Poland.

No.	Province	Number of documents before screening	Number of documents after screening	Number of pages analyzed
1	Dolnośląskie	140	2	12
2	Kujawsko-pomorskie	58	0	-
3	Lubelskie	148	3	10
4	Lubuskie	29	21	80
5	Łódzkie	34	2	7
6	Małopolskie	94	12	31
7	Mazowieckie	-	-	-
8	Opolskie	46	8	38
9	Podkarpackie	93	47	280
10	Podlaskie	63	12	40
11	Pomorskie	107	49	186
12	Śląskie	27	21	109
13	Świętokrzyskie	39	11	42
14	Warmińsko-mazurskie	61	9	57
15	Wielkopolskie	48	3	17
16	Zachodniopomorskie	90	11	60
Total		1077	211	969

criteria were developed to determine the relevance of notes and all documents were evaluated for potential inclusion in the analysis. First, documents needed to report on the discussion that occurred during a meeting to allow for our interpretation and assessment. In several cases, notes were technical documentations of an area or focused on topics outside the scope of this study such as lists of protected species. Of all 1077 documents, 154 were excluded because they did not meet the first criterion. Second, a form of a narration was required so we could connect stakeholders to particular statements. Several documents omitted these details which would have prevented us from identifying the specific stakeholders or groups that were engaged in discussion. A total of 712 documents were excluded due to the second criterion, and ultimately, 211 were selected for analysis across 14 provinces (the Kujawsko-Pomorskie province did not generate any suitable documents), amounting to 969 pages of text (Table 1). Additionally, all documents were unevenly distributed among provinces due to variation in consultation processes and documentation procedures.

Phase 2 focused on developing a coding scheme for analysis of ES and the broader context. The ES coding scheme spanned the following ES types identified by CICES V4.3 (Haines-Young and Potschin, 2013): 1) *Provisioning*: nutritional, material and energetic outputs from the ecosystem; 2) *Regulation and Maintenance*: the ways in which ecosystem can mediate or moderate the ambient environment that affects human performance; and 3)

Cultural: the non-material and normally non-consumptive outputs of ecosystem that affect the physical and mental states of people. The coding scheme thematically evaluated the content discussed and indicated whether direct or indirect references to ES were made by stakeholders. The former was marked when an exact appearance of the ES term appeared in the text, while the latter was marked when parts of the text expressed the purpose of the ES frame through as discussions about services such as flood prevention, fishing economies, and recreation.

In addition to analyzing meeting notes for direct and indirect engagement with three ES categories, we considered how stakeholder discussions were framed. In line with Beery et al. (2016), we coded all data across three frames: 1) Neutral: a descriptive statement free of negative or positive judgment linking *Provisioning*, *Regulation and Maintenance*, and *Cultural* ES with human activities; 2) Positive: a prescriptive statement about benefits for the environment and/or society related to *Provisioning*, *Regulation and Maintenance*, and *Cultural* ES; and 3) Negative: a prescriptive statement that includes negative judgment linking *Provisioning*, *Regulation and Maintenance*, and *Cultural* ES with

human activities. Several examples of negative statements touched on issues such as poaching or stealing wood thieves, less access to resources, and impacts of protected species like beavers which cause flooding and damage to farmlands.

Phase 3 of the analysis focused on coding. In this stage, we deductively coded and quantified stakeholder engagement with services provided by the Natura 2000 network (Elo and Kyngäs, 2008). Interpretive techniques were also applied to understand the broader context of statements (Ahuvia, 2001). These techniques were guided by principles in grounded theory (Glasser and Strauss, 2017) to identify emergent themes and better understand how and why statements were classified into the predetermined ES categories. Following Asah et al. (2014), the passages that were identified as representing *Provisioning*, *Regulation and Maintenance*, and *Cultural* ES types were normally around one paragraph in length. To do this, we engaged in an iterative process whereby discussions of ecosystem's benefits were identified, segregated, grouped, regrouped, and linked to other texts and codes (Saldaña, 2015). We also coded all references to ES in terms of the direct and indirect references made by stakeholders, and adopted these same methods to determine whether descriptive or prescriptive statements were made during public consultation meetings (Table 2). All data were analyzed by two researchers, one social scientist and one natural scientist, for interrater reliability. These two individuals coded independently and later discussed their interpretations and uncertainties (Ahuvia, 2001; Denzin and Lincoln, 2005). NVivo 10 software was used for coding and retrieval of the coded text to explore how the ES frame appeared in discussions during public discussions of management plans in Poland.

Finally, Phase 4 focused on attributing land cover categories to stakeholder discussions. We coded all statements according to the type of area where the meeting occurred using biogeographical data from the Natura 2000 sites. Specifically, we applied the land cover categories identified in the Mapping and Assessment of Ecosystems and their Services ("Typology of ecosystems — Biodiversity Information system for Europe", 2018) to each public document to better understand the social-ecological relationships between stakeholder engagement with ES and the biophysical conditions being evaluated. For this procedure, the following categories were applied: 1) urban; 2) cropland; 3) grassland; 4) woodland and forested land; 5) heathland and scrub; 6) sparsely vegetated habitats; 7) mires, bogs and fens (wetlands); 8) lakes and rivers; and 9) mixed. Given that our analysis concerned only terrestrial Natura 2000 areas, we disregarded four land cover categories: 1) marine, 2) coastal, 3) shelf, and 4) open oceans.

4. Results

4.1. Extent of the ecosystem service frame appearance in public consultation

In response to the first research objective, analyses revealed that the ES frame served as a launching point for public discussions of management plans for Natura 2000 sites in Poland, but in an indirect way. Within the 211 analyzed documents, 939 references were made to one of the three ES categories (i.e., *Provisioning*, *Regulation and Maintenance* and *Cultural* ES) across 174 notes. The most represented type was *Provisioning*, followed by *Regulating and Maintenance*, and then *Cultural* (Table 3).

4.2. Ecosystem services in descriptive or prescriptive frames

The distribution of particular ES frames (i.e., the second research objective) was highly uneven across descriptive and prescriptive contexts (Fig. 1). Almost two thirds of manifestations were neutral, in that they reflected states and processes, as illustrated by the following example: "Species can persist because the habitat depends not only on the use, but first of all on the habitat conditions associated with moist soil" [neutral; *Regulation and Maintenance* ES; note 83]. Over one third of

Table 2

Illustrative quotes of neutral, positive, and negative contexts of ecosystem services (ES) discussed during public consultation meetings focused on management of Natura 2000 areas in Poland.

ES frame	Context		
	Neutral	Positive	Negative
Provisioning	“... willingness to cooperate with Polish Angling Association in order to collect information about the fishing economy on the lake.” [note 41] “... logging for sale within the area did not pose a threat to bats.” [note 161]	“For cultivation of meadows, grazing would be the best.” [note 185] “... bats' guano is a valuable fertilizer which could be used in many crops.” [note 70]	“... threat posed by poachers to the fauna of the lake.” [note 21] “... despite the great involvement of forestry service it is very difficult to eliminate wood theft within this protected area.” [note 56]
Regulating and Maintenance	“... fresh meadows which provide patched of habitats for endangered bats are located only on private lands.” [note 71] “... maintenance of this area is our obligation by law as it provides habitats for endangered species.” [note 69]	“... the idea of creating the Turawa Reservoir was associated with the retention conditions, and the reservoir's leading function was flood protection for the region.” [note 41] “... emphasized the role of biodiversity and the function of meadows for the treatment of surface waters.” [note 81]	“... interference in the forest state may worsen the feeding conditions for bats within their habitat.” [note 56] “... regulating the estuary disturbs the natural conditions of the estuary and affects the periodical overdrying of habitats for endangered species within this area.” [note 124] “... angling and water sports should be represented by a category—called scaring birds.” [note 41]
Cultural	“Concerning the recreational use of an oxbow lake, the shape and size of the platform on the oxbow lake should be consulted with the Angling Association, because it knows the best needs of anglers.” [note 90] “... establishment of agritourism does not disturb the landscape, but it will be necessary to prepare an appropriate environmental report.” [note 134]	“... tourism is desirable in this Natura 2000 area.” [note 147] “Xerothermic grasslands, which occur in this area, are few in our region, very floristically rich and very nice.” [note 94]	“It should be noted that one of the dunes is destroyed by quads.” [note 185]

passages were prescriptive, in that they involved judgments on actual states or processes concerning the environment. Specifically, the narrative included 25% negative and 10% positive tones. For example, one stakeholder claimed that “... threats and protective actions to the plans of protective tasks are listed, therefore the hazard category, which is fishing, does not refer to the fishing itself, but actually to the effects of improper practicing of this activity” [negative; *Cultural* ES; note 41] and the another stated that “... bats' guano is a valuable fertilizer which could be used in many crops.” [positive; *Provisioning* ES; note 70]

4.3. Ecosystem services frames adopted by groups of stakeholders

The use of ES frames was evaluated across a range of stakeholder groups. A majority (88%, N = 826) of references to ES and their associated frames were directly associated with particular stakeholder groups (Table 4). These frames, especially *Regulation and Maintenance*, were used most frequently by: 1) plan managers (e.g., representatives of the Directorates of Environmental Protection, entities responsible for preparation of management plans); 2) representatives of the National Forest; and 3) scientists who had expertise in areas such as environmental protection. Others stakeholder groups also used the ES framework but focused on different types of services, mostly *Provisioning*.

4.4. Ecosystem services frames used in particular ecosystems

In response to the final research objective, use of the ES frame was analyzed across land cover categories. There were eight types of

ecosystems identified: 1) urban; 2) cropland; 3) grassland; 4) woodland and forested land; 5) heathland and scrub; 6) mires, bogs and fens (wetlands); 7) lakes and rivers; and 8) mixed. We observed that the most abundant landscape type discussed by stakeholders was woodland and forested land, appearing in 60 documents, followed by rivers and lakes in 46 documents, urban areas and grassland in 36 documents, wetlands in 20 documents, cropland in seven documents, and heathland, scrub and mixed in three documents each (Table 5). The *Regulation and Maintenance* services were relatively dominant (47–57%) across the following land cover categories, spanning urban, grassland, mires, bogs and fens (wetlands), and mixed landscapes. *Provisioning* services were tied to (47–67%) cropland, woodland and forested land, heathland and scrub and lakes, and rivers land cover categories. *Cultural* services were not dominant in any land cover categories but were relatively significant (17–19%) in urban mires, bogs and fens (wetlands), land cover categories. By and large, statements across all land cover categories were couched in a neutral tone of discussion.

Following our analysis of the relationship between ES narratives and land cover categories, we identified the land management issues around which particular ES appeared during public consultations. We identified 24 types of land management issues and found that the distribution of ES across these categories was highly uneven (Table 6). The key issues discussed were related to management regulations on habitat (23%), setting borders around protected areas (15%), language used by agencies (13%), and limitations on farmland (10%). One example quotation was from a stakeholder who discussed tourism infrastructure that could protect valuable habitat from degradation: “The location of

Table 3

Occurrence of *Provisioning*, *Regulation and Maintenance* and *Cultural* ecosystem services and example quotations from secondary data drawn from public consultation meetings about management plans in Natura 2000 areas in Poland (N = 942).

Ecosystem Services	Example quotation	Number of references in documents	Percent
Provisioning	“One needs to manage the mowed biomass waste from the mowed permanent grasslands” [note 5]	425	45%
Regulation and Maintenance	“The role of biological diversity and the function of pastures in terms of treating surface waters are crucial” [note 81]	410	44%
Cultural	“Will there be any prohibitions introduced concerning e.g. recreation in this area?” [note 38]	104	11%
Total		942	100%

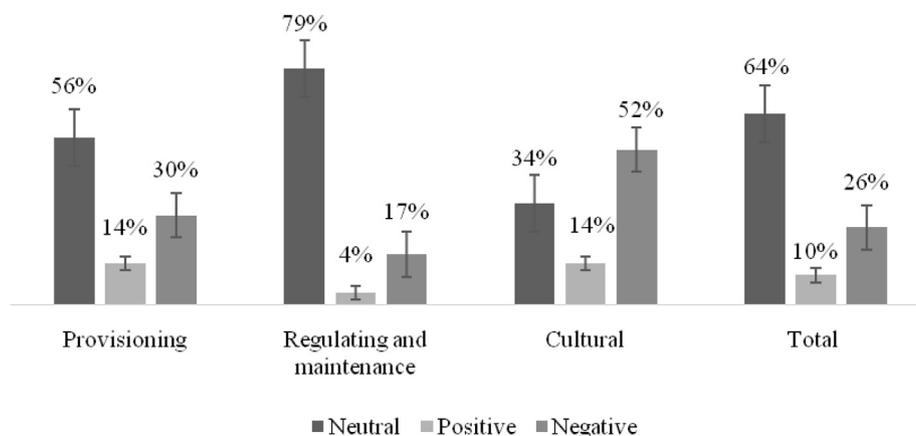


Fig. 1. Frequency of the ecosystem service frames adopted to represent *Provisioning*, *Regulation and Maintenance* and *Cultural* services discussed during meetings about management plans for Natura 2000 areas in Poland in three types of context (neutral, positive and negative).

the agrotourism farm nearby is beneficial for the protection of the reserve because it catalyzes tourist traffic and is a place where one can leave his car” [positive; *Cultural* ES; note 54]. Another participant proclaimed in her description of management that a certain amount of land would need to be set aside for protection: “the preliminary indicators of forest habitat status assessment would require 20 m³ per hectare, with coarse woody debris being unevenly distributed [neutral; *Regulation and Maintenance* ES; note 57].

Multiple descriptive contexts were referenced in discussions about ES policies. All neutral land management issues had precise meanings, and referred to facts or technical conditions such as the principles and aims of Natura 2000. For example, one participant explained that, “the Natura 2000 area is not a reserve; there is only one principle here - no deterioration of habitats and species.” [neutral; *Regulation and Maintenance* ES; note 176]. All of the positive frames connoted precise meanings tied to valuable species and habitats. For example, one participant emphasized the following: “the management plan records will concern only valuable natural habitats being objects of protection and not the entire Natura 2000 area” [positive; *Regulation and Maintenance* ES; note 117]. All *Provisioning* services that were framed as positive and involved direct utilization of natural resources. Another participant discussed the coexistence between human activities and protected areas, which positively impacted forestry: “thanks to the forest management model in the area, the protection objects of the forest shelters are maintained [positive; *Provisioning* ES; note 15]. Finally, the negative context was also present during public discussions of the Natura 2000 areas, including illegal or damaging use of natural resources such as tillage and developments to accommodate anglers, as illustrated by the following passage: “As a potential threat to riparian habitats, he mentioned the possible creation of new fishing ponds” [negative;

Provisioning ES; note 130].

5. Discussion

5.1. Use of ecosystem services in public consultation

This study overlaid the ES framework on notes from public discussions about the management of Natura 2000 areas in Poland to better understand how stakeholders framed their perceived relationship with the environment. Drawing on discourse analysis (Hajer, 1995) and Framing Theory (Goffman, 1974), we sought to observe how the ES concept was (indirectly) engaged during these meetings given the prominence of ES in regulatory procedures and utility in practice. *Provisioning* and *Regulation and Maintenance* ES were most pronounced in stakeholder deliberations. The broader context of these benefits was highly variable, though many narratives were situated in descriptive (i.e., neutral) terms that simply depicted natural resource conditions. *Cultural* ES that represented tangible (e.g., recreation and tourism revenue) and intangible qualities of nature (e.g., pride, beauty) were mentioned less often, connected with negative patterns of behavior such as noncompliance with rules and regulations, and were largely framed in prescriptive terms. These findings indicated that *Cultural* ES were most contested but least considered across a range of stakeholder groups. Although *Cultural* ES are sometimes investigated in ways that align with *Regulation and Maintenance* ES (Czúcz et al., 2018), they may be neglected by decision-makers and stakeholders because of their value-laden context (van Ripper et al., 2017b; Willcock et al., 2016). In-depth discussions directed toward *Cultural* ES are needed to confront public concerns and foster discourse about benefits for human well-being, in accordance with the aims of biodiversity conservation policies

Table 4
Frequency of ecosystem services (ES) frames and the context of the discussions in particular groups of stakeholders (N = 826).

ES frame and context	Plan managers (n = 404)	National forest (n = 134)	Science (n = 79)	Other administrators (n = 69)	NGOs (n = 34)	Municipality (n = 31)	Business (n = 15)	Village head (n = 13)	Farmers (n = 11)	Other (n = 36)
<i>ES frame</i>										
Provisioning	37%	48%	29%	62%	59%	61%	80%	54%	82%	50%
Regulation and maintenance	55%	44%	57%	29%	15%	23%	20%	31%	9%	28%
Cultural	8%	8%	14%	9%	26%	16%	0%	15%	9%	22%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100	100%
<i>Context</i>										
Descriptive	71%	65%	70%	61%	53%	61%	60%	62%	45%	53%
Positive	8%	10%	11%	9%	15%	13%	20%	0%	27%	8%
Negative	21%	25%	19%	30%	32%	26%	20%	38%	27%	39%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 5

Frequency of ecosystem services (ES) frames and the context of the discussions across land cover categories (N = 939). The highest values are in a bold font style.

ES frame and context	Urban (n = 87)	Cropland (n = 49)	Grassland (n = 226)	Woodland and forested land (n = 247)	Heathland and scrub (n = 15)	Mires, bogs and fens (wetlands) (n = 68)	Lakes and rivers (n = 234)	Mixed (n = 14)
<i>ES frame</i>								
Provisioning	31%	49%	42%	47%	67%	34%	53%	43%
Regulation and maintenance	52%	39%	51%	43%	20%	47%	35%	57%
Cultural	17%	12%	7%	10%	13%	19%	12%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%
<i>Context</i>								
Neutral	60%	61%	60%	66%	67%	78%	62%	93%
Positive	13%	16%	12%	8%	13%	4%	9%	0%
Negative	28%	22%	28%	26%	20%	18%	29%	7%
Total	100%	100%	100%	100%	100%	100%	100%	100%

in Poland and abroad (cf. Maczka et al., 2016).

5.2. Types of ecosystem service frames used by stakeholders

Our findings underlined the importance of distinguishing among categories of ES and identifying the communication tools that enabled deliberation about management of natural resources. The frames analyzed for this research were unequally weighted in conversations and across ES types, in that descriptive and prescriptive (either positive or negative) contexts were observed to differing degrees. *Cultural* ES, in particular, often elicited an emotional valence that will be important to recognize in future research and practice because these services can serve as indicators of social conflict. Moreover, given that *Cultural* ES are at risk of moving out of boundary object status into a more standardized state (Steger et al., 2018), we urge future researchers and practitioners to maintain interpretive flexibility that will accommodate different viewpoints and facilitate dialogue about competing interests (Abson et al., 2014).

Results from our assessment of how ES were approached across

sectors provided useful insights into how subgroups of stakeholders viewed their relationship with the environment and strived to accomplish different end goals (Steger et al., 2018). On one hand, environmental experts and scientists were more likely to focus on issues such as biodiversity conservation and refer to *Regulation and Maintenance* ES. This could be due to their competencies concerning the environment (e.g., knowledge of farming regulations) (Maczka et al., 2016) or familiarity with scientific language used in EU Natura 2000 policies that are species- and habitat-oriented (Guttenbrunner, 2009). On the other hand, land users such as farmers, business etc. tended to have different end goals focused on economic sustainability and also adopted language that aligned with the anthropogenic assumptions of the ES framework. These individuals were also more likely to adopt normative stances and reference *Provisioning* ES. Thus, the public consultations analyzed in this study showed dynamic interactions that engaged the ES concept as a boundary object to express different interpretations of ecosystems and human communities.

ES were instrumental in the participatory processes analyzed in this study given that they supported transdisciplinary, action-oriented

Table 6

Land management issues discussed about provisioning, regulating and maintenance, and cultural ecosystem services (ES) frames across neutral, positive and negative context (N = 856).

Context and ES frame	Types of land management issues	Number of times referenced	Percent
Neutral context			
<i>Provisioning</i>	Characteristic of uses (e.g., the kind of farming that exists within the protected area)	64	7%
	Organizational and/or management possibilities (e.g., where to establish protected area border)	126	15%
	Mechanism for coexistence in human activities and protected area (e.g., minimizing impacts of forestry)	48	6%
<i>Regulating and maintenance</i>	“Natura 2000 language” (e.g., its principles and aims)	114	13%
	Organizational/management possibilities in terms of regulation (e.g., how to maintain a habitat)	194	23%
	Circumstances of habitat formation	4	0%
<i>Cultural</i>	Recreation and tourism	19	2%
Positive context			
<i>Provisioning</i>	Organizational and/or management options for tourism (e.g., establishing walking paths)	16	2%
<i>Regulating and maintenance</i>	Valuable species and habitats	7	1%
	Human protection by nature (e.g., meadows protect from floods)	7	1%
<i>Cultural</i>	Pride and beauty	6	1%
	Education and heritage	2	0%
	Tourist infrastructure that protects valuable habitat from degradation	1	0%
	Promotion and development	7	1%
Negative context			
<i>Provisioning</i>	Lack of use (e.g., mowing meadows is beneficial for the habitat but nobody does it)	13	2%
	Illegal forms of human use (e.g., poaching)	13	2%
	Limitations of farmland	89	10%
	Damage caused by protected species (e.g., beavers cause damage to farmlands and flooding)	8	1%
<i>Regulating and maintenance</i>	Damage in habitats caused by anthropogenic pressures or other species (e.g., boars)	58	7%
	Illegal use of regulating and maintenance services (e.g., illegal dumps)	7	1%
	<i>Cultural</i>	Collecting valuable species (e.g., butterflies)	3
<i>Cultural</i>	Limiting tourist activities (e.g., walking)	38	4%
	Limiting tourist infrastructure (e.g., construction of a playing field)	4	0%
	Illegal tourism (e.g., illegal barbecuing)	8	1%
	Total		856

communication about resource management. Although we focused primarily on connecting the indirect discussions of ES to the framework outlined in CICES V4.3 by Haines-Young and Potschin (2013), we provided insight on the types of stakeholder groups engaged in deliberation about land management issues that warrant attention, particularly surrounding regulations (e.g., establishing protected area borders) that would affect local residents. Identifying relevant subgroups of stakeholders is important to facilitate communication about salient topics with particular groups and shape message frames to align with existing belief systems (Kemp et al., 2017). These forms of communication carry potential to provide deeper information on how to advance place-based dialogues about (dis)similar goals for natural resource conservation, promote effective problem solving focused on social-ecological and participatory issues, and create a platform for considering how socio-economic and cultural land management issues vary across a range of land use contexts (Muhar et al., 2017; Pecurul-Botines et al., 2014; Zhang et al., 2016).

Participatory management of Natura 2000 areas is complex not only due to the array of viewpoints held by stakeholder groups but also because of the diverse ecosystems being managed. We identified the land cover categories that supported various benefits discussed by stakeholders, and observed that woodland and forested land were the most common of eight land cover categories. Discussions in these contexts were largely neutral indicating that these spaces would be less likely to generate social conflict than environments that were contested and associated with *Cultural* ES. Our results align with past research that has indicated distinct land cover categories such as evergreen forest (Brown and Brabyn, 2012) and open water (van Riper et al., 2017a) are more likely to embody diverse values. Public land management agencies that rely on the ES framework to manage ecosystems and communities should carefully consider how dialogue and treatment of social-ecological issues may vary across different landscapes, especially in contexts where competing interests are being negotiated among stakeholders.

Although we contend that ES can be treated as boundary objects to help identify and solve problems from different disciplinary perspectives across land cover categories, this framework is not without limitations. It has potential to focus attention on commonalities rather than pre-existing biases that can lead to communication failures (Deliège, 2016; Kenter et al., 2016a). However, simultaneously, it can blind people to policy outcomes spanning social and ecological systems. That is, the simplicity of the ES stock-flow concept can eclipse the complexity of resource management challenges faced by society in an array of settings (Muradian and Rival, 2012; Norgaard, 2010). Given that public discourse varies across countries and cultures (Mensah et al., 2017; Quyen et al., 2017), it is critically important to consider the historical contexts for valuation. In this study, Polish citizens had very little influence on decision making during the communist period (1945–1989). A culture of responsibility and collective decision-making was only recently built so the contested nature of *Cultural* ES may be tied to the historically limited levels of public participation (Maczka et al., 2016).

5.3. Future application of ecosystem service frames

To better understand and manage complex systems that involve human and biological communities, there is a strong need to develop communication tools that enable diverse stakeholders and researchers from different fields of study to work together. In line with previous research indicating that various ES types may be operating differently as instruments for communication (Kenter, 2016; Kenter et al., 2016b; Steger et al., 2018), our findings reinforced the notion that ES were launching points for exploring (dis)similar interests on descriptive or prescriptive pathways. Although the majority of discussions about Natura 2000 areas were descriptive, normative claims were made that warrant careful consideration by decision-makers to minimize

communication failures due to differing values and interests that intersected discourse (Deliège, 2016; Schröter et al., 2014). In particular, *Cultural* ES were often framed prescriptively and were most likely to be framed negatively, indicating that they require careful attention in future work.

Our analysis showed that the ES concept functioned as a conduit for stakeholders to discuss both instrumental and non-instrumental, intrinsic values (e.g., pride and beauty of nature) or non-monetary benefits (e.g., regarding education). However, these conversations took place less frequently. Although ES were engaged beyond purely economic and instrumental values to express the broad relationships formed between people and places (Chan et al., 2016), this concept did not act as a binding agent for discussion (Norgaard, 2010). In other words, the ES concept was used to varying degrees, and for many experts that dealt with this concept in a more explicit manner, opened up new possibilities for recognizing complexity across ES categories. Use of this framework also engaged with the priorities set forth in national-level planning frameworks (Scholte et al., 2015) and assisted with tradeoffs in protected area management by simplifying the “bins” or types of services that were being affected and discussed (Schirpke et al., 2017). We argue that this framework will be particularly useful for Natura 2000 areas that aim to move away from more technocratic scientific processes toward inclusive conservation (Ferranti et al., 2014).

6. Conclusion

Results from this research show that for Poland’s case, a country reforming and consolidating its environment protection system, the ES frame can be a useful communication tool that enables stakeholders from opposing stakeholder groups (e.g., foresters, NGOs, the private sector) to deliberate about the future of Natura 2000 areas. In this respect, the ES frame can not only simplify tradeoffs and raise visibility of complexity, but also act as a flexible boundary object that remains open to local circumstances. Due to the prevalence and patterns of this framework in public deliberation about management of the protected area system in Poland, we argue that European-level policies that aim to embrace bottom-up approaches to decision-making and incorporate the experiences of stakeholders can be advanced through engagement with ES. This framework can not only be used as a tool for descriptively reviewing management challenges, it can also be used to create space for making prescriptive claims that warrant attention in public forums and minimize conflicts about the future of protected landscapes.

7. Declarations of interest

None.

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Appendix A. Supplementary data

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