



Analysis

Value asymmetries in Norwegian forest governance: The role of institutions and power dynamics

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ABSTRACT

We draw on institutional and ecological economics to understand the role of social preferences, institutional arrangements, and power dynamics in mobilizing or restraining ecosystem services and values in Norwegian forest governance. Specifically, we i) elicit local people's preferences over forest ecosystem services and values, ii) analyze how perceptions of forest values vary across stakeholders, and iii) examine how participation is enabled by institutional arrangements. Our data were collected from a survey ($N = 1694$) distributed in 10 rural municipalities and from interviews with Norwegian forest experts and stakeholders ($N = 15$). Four results are highlighted. First, most respondents rank ecosystem services that embody relational and intrinsic values (such as recreation and biodiversity) higher than services that primarily embody instrumental values (timber). Second, women and non-forest owners show higher appreciation for relational values than men and forest owners. Third, dominant value-articulating institutions, such as timber markets and cost-benefit analysis, favor utility, efficiency, and instrumental values. Finally, few participatory arenas for decision-making are available, and local people do not feel empowered in forest governance. Our findings indicate that Norwegian forest governance primarily empowers actors that emphasize instrumental values followed by those who emphasize intrinsic values, whereas relational values tend to be restrained.

The kind of values that are dominant in society is determined by power relations, for example because economic and political interests determine which values - and whose values - have most traction in decision-making. Mobilizing alternative and more diverse values therefore involves changing power relations, empowering those whose values have been rendered less visible (...). (Martin et al., 2022:4).

1. Introduction

Forests provide multiple ecosystem services, including raw materials, food, recreation, sense of place, carbon sequestration, and habitats for biodiversity (Brocknerhoff et al., 2017; Jenkins and Schaap, 2018).

One fourth of all valuation studies globally address forests (IPBES, 2022a), and policy initiatives such as the Sustainable Development Goals (SDGs), the Convention on Biological Diversity, and the EU forestry strategy 2030 (European Commission, 2021) put forests and forest's benefits at center-stage in international sustainability agendas.

Environmental science and policy increasingly emphasize assessment and decision-support frameworks that integrate plural values of nature (Jacobs et al., 2016; Pascual et al., 2017). Yet, the IPBES (2022a) assessment of nature's values found that decision-making processes remain primarily guided by a narrow set of market-oriented values. This finding resonates with growing interest in participatory processes for sustainable forest governance (see e.g., Kangas et al., 2010; Sandström et al., 2020; Sheppard and Meitner, 2005) and with ongoing discussions on the role of power and institutions (conventions, norms, and legal rules)

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in defining which values gain prominence over others in scientific and political agendas (Martin et al., 2022; Martínez-Alier, 2003; Vatn, 2005).

This research draws on theory from ecological economics and institutional theory to understand the role of social preferences, institutional arrangements, and power dynamics in mobilizing or restraining specific ecosystem services and values in forest governance. Key terms guiding our analysis include environmental governance, value incommensurability, and value-articulating institutions. *Environmental governance* refers to the “use, management and protection of environmental resources and processes” (Vatn, 2015:134), which typically involves conflicts regarding who should get access to resources, whose interests are prioritized, and how nature should be valued (ibid).

Incommensurability of values entails the idea that nature bears diverse values that cannot be compressed into a single metric or measurement rod (Gómez-Baggethun and Martín-López, 2015; Martínez-Alier et al., 1998; Martínez-Alier, 2003). The idea of incommensurability is thus tightly connected with the recognition of plural values that are irreducible to each other. Decision-support frameworks that acknowledge value incommensurability, such as multi-criteria valuation, have been long used in ecological economics (Martínez-Alier et al., 1998; O'Neill and Spash, 2000; O'Neill et al., 2008), and have received renewed attention in the extensive literature on integrated valuation of ecosystem services over the last decade (Dendoncker et al., 2013; Gómez-Baggethun et al., 2014; Langemeyer et al., 2018; Saarikoski et al., 2016).

Through a distinction between worldviews, broad values, and specific values, the IPBES values assessment (2022b) expands on the concept of value pluralism. It defines *worldviews* as “mental lenses through which humans social groups perceive, think about, interpret, inhabit and modify the world. Rooted in *cultural traditions*, they shape and are shaped by *knowledge systems, languages and values*” (IPBES, 2022a:546; italics in the original). *Broad values* are defined as the: “life goals, general guiding principles and orientations towards the world that are informed by people’s beliefs and worldviews (Dietz et al., 2005)” (IPBES, 2022a:545). Broad values include both *moral principles* (such as justice), and *life goals* (such as prosperity), and they underpin *specific values* of nature, defined as “(...) judgments regarding the importance of nature in particular situations.” (IPBES, 2022b:10). Specific values are classified in three main categories: instrumental, intrinsic, and relational values. *Instrumental values* refer to values that: “relate to things that are a means to a desired end (...)” (ibid.), while *intrinsic values*: “relate to the values of nature expressed independently of any reference to people as valuers (...)” (ibid.). Lastly, *relational values* refer to: “the meaningfulness of people-nature interactions, and interactions among people (including across generations) through nature (e.g., sense of place, spirituality, care, reciprocity).” (ibid.).

As opposed to primarily perceiving values and preferences as individual and given, classical institutional economics emphasizes that values are significantly shaped by societal and collective processes – implying that values are largely expressions of culture (Vatn, 2015). Moreover, power dynamics defining existing institutional arrangements play an important role in defining which values are perceived as legitimate and important in decision-making processes (ibid.). The role that institutional arrangements play in valuation processes can be analyzed through the concept of *value-articulating institutions* (VAI’s) (see e.g., O'Neill and Spash, 2000), defined as “rule structures facilitating the articulation of values and interests” (Jacobs, 1997 cited in (Vatn, 2015:264). VAI’s are “based on rules defining which values can be expressed and in what form” (Anderson et al., 2022:61). These rules are embedded in evaluation methods and decision support frameworks, such as cost-benefit analyses, multicriteria analysis, or deliberative valuation. In this way, VAI’s act as frames invoked in the process of expressing values that regulate and shape which values come forward, which are excluded, and what sort of conclusions and policy recommendations can be reached (Vatn, 2005).

This paper draws on the case of Norwegian forest governance to examine people’s values and preferences of forest ecosystem services,

and to analyze how institutions mobilize or restrain different forest values, and how different actors are correspondingly empowered or disempowered in forest governance. To this end, the paper pursues the following objectives: i) to examine which forest ecosystem services are considered most important by local communities in Norwegian rural areas, ii) to assess how appreciations of different services and values relate to specific socio-demographic characteristics, iii) to examine which value-articulating institutions dominate Norwegian forest governance, and iv) to discuss the ways in which these value-articulating institutions support or undermine the values and interests of different socio-demographic groups.

2. Forest governance in Norway

Forests cover one third (37%) of Norway’s land area and have historically been critical for livelihoods throughout the country (Bækkelund, 2020; Hoen et al., 2019; Tomter and Dalen, 2018). As much as 77% of the productive forest areas are today privately owned, partly due to historical processes of privatization and enclosure dating back to the 1600s (Gangdal, 2011) and accelerated in the 1800s (Skogen, 2018). Most of the forest properties are owned by *smallholders*; 60% are smaller than 25 ha, and 90% are smaller than 100 ha (Statskog, 2015).

While a state-driven shift from selective cutting to even-aged stand management (i.e., clear-cutting and planting of monocultures) has tripled forest biomass since around 1920, employment in forestry fell from around 28,500 in 1950 to 6600 in 2018 following mechanization and tertiarization of the economy (SSB, 2021b; Tomter and Dalen, 2018). Although forests are still important sources of revenue for some communities, the primary role of forests has gradually shifted from livelihoods to recreation, home for biodiversity, and carbon sinks (Helseth et al., 2022; Hoen et al., 2019). Yet, the ecological condition of Norwegian forests is relatively poor,² mainly due to intensive even-aged forest management and infrastructure developments in forest areas (Framstad et al., 2022).

Key legislations affecting Norwegian forest governance include the Forestry Act, the Outdoor Recreation Act, the Nature Diversity Act, and the Planning and Building Act (Tomter and Dalen, 2018). While the Planning and Building Act guide municipal planning (with requirements for public participation) (Lovdata, 2008), the introduction of the Nature Diversity Act in 2009 brought increased attention to issues regarding biodiversity (Lovdata, 2006; Lovdata, 2009). However, recent critics hold that the decision-making processes related to forestry (such as building of forest roads), are primarily guided by the Forestry Act, with minor public involvement (see e.g., Altinget, 2023).

Moreover, reports showing that Norwegian forest governance favor provisioning ecosystem services at the expense of supporting, regulating, and cultural services, suggests that broader deliberation over forest values is required to inform national sustainability agendas (see e.g., Aspøy and Helseth, 2022; Aspøy and Stokland, 2022; Bartlett et al., 2020; Helseth et al., 2022; Lindhjem and Magnussen, 2012; Nesbakken, 2022). This also connects to calls for improved knowledge on how diverse values and preferences are reflected and mobilized in different European forest governance regimes (Lindahl et al., 2017a; Lindahl et al., 2017b; Primmer et al., 2021; Sandström et al., 2020).

3. Framework and methods

Data for this research were drawn from three main sources: i) a literature review, ii) in-depth interviews with forest experts and stakeholders ($N = 15$), and iii) a survey ($N = 1694$) distributed among local inhabitants in 10 rural municipalities in Norway (Fig. 2).

² The ecological condition of Norwegian forests is classified with the value of 0.42, against a “good condition” of 0.6, and with an optimal/ maximum score of 1.

3.1. Literature review

To get an overview of ecosystem services, values, and institutions in Norwegian forest governance, we reviewed policy documents, scientific papers and reports, books, media articles, and grey literature. Our primary focus was to i) identify main VAI's guiding decisions affecting forestry practices and infrastructure development in forest areas, and ii) assess each VAI following the criteria described in Section 3.3. Results from the initial literature review were used to inform the framing of the survey (see Section 3.2.) as well as the design of the interview guide (see Section 3.3).

3.2. Survey

We designed a digital survey in cooperation with the Norwegian Centre of Competence on Rural Development and the relevant municipalities.³ The survey had multipurpose aims of producing knowledge for policy development nationally and locally (see e.g., Skavhaug et al., 2022). It was tested with a national reference group ($N = 11$) before it was revised and distributed among inhabitants of Hyllestad, Fjaler, Askvoll, Solund, Bykle, Vang, Grue, Sør-Aurdal, Engerdal and Rendalen municipalities from November 2021 to April 2022 (Fig. 1). These 10 municipalities were selected to represent a mix of forest areas and nature types.

Solund, Vang, Bykle, and Askvoll are typical coastal or mountain areas, with relatively low forest cover (see Table 1). Fjaler and Hyllestad are relatively small coastal municipalities, but with larger shares of forests than the former mentioned. Grue, Sør-Aurdal, Engerdal, and Rendalen all have vast forest areas, in which forest is important for local livelihood and culture, although Engerdal has less active forestry (SSB, 2023b). Based on the level of active forestry over the last 10 years, we grouped the municipalities as either 'forestry communities' (Grue, Rendalen, and Sør-Aurdal) or 'communities with less active forestry' (Solund, Vang, Bykle, Askvoll, Hyllestad, Fjaler, and Engerdal) (Fig. 2).

The survey consisted of two main parts. The first section contained closed questions covering issues of social, environmental, and economic sustainability, both relating to the local community and to national/international issues (see questions in Table A.1. in Appendix). Second, the survey also covered closed questions about forest values and ecosystem services (see Section 3.2.1). Socio-demographic variables collected for our case study include i) age, ii) gender, iii) level of education, iv) level of income, and v) forest ownership (including size of forest area).

The survey was distributed online via the municipal administrations, and it was spread through different channels, including the municipalities' websites, social media, local organizations, and/or local newspapers. The survey stayed open for approximately 1 ½ month in each municipality, and participation was anonymous. The survey was open to all inhabitants, and thus based on self-selection (not on a randomized sample). This may entail a representation bias towards specific groups, such as people with particular interest in issues of local community development, or with more time available. To encourage diverse participation, the survey was framed as a broad inquiry of inhabitants' views on local development, in which all local voices mattered. We monitored responses, and were we noticed low participation from certain groups (e.g., those aged below 35), the municipality was notified, and then made extra efforts to reach these groups.

3.2.1. Perceived importance of forest ecosystem services

After posing the question: "In which way is the forest in the municipality most important to you and your local community?", we asked

³ Norwegian municipalities are local governmental bodies with a political level (city council) and an administrative level. Both levels were represented in developing the survey.

respondents to grade (from 1 to 5) the importance of 9 specified forest ecosystem services. These services were chosen based on previous research identifying the most important ecosystem services from Norwegian forests (Berglihn and Gómez-Baggethun, 2021; Helseth et al., 2022; Lindhjem and Magnussen, 2012). The dual formulation of the question was intended to make respondents reflect on the importance of forests both in terms of individual preferences and community values, as respondents tend to display different values when asked in individual (e.g., as consumers) vs. collective contexts (e.g., as citizens) (Sagoff, 1998). We also included the (optional) open question: "do you have other thoughts on the importance on forest for you and your local community?"⁴

For data analysis, we classified forest ecosystem services according to established international categorizations of supporting, cultural, provisioning, and regulating services (MEA, 2005; TEEB, 2010) (Table 2). Further, we followed the IPBES (2022a) classification of instrumental, intrinsic, or relational values to identify which values are most prominent in each ecosystem service (see also Arias-Arévalo et al., 2017). Some services may embody multiple values (see e.g., Arias-Arévalo et al., 2017; Gómez-Baggethun et al., 2016). As an example, hunting and harvesting of berries provide food (instrumental), but are important sources of relational values for significant shares of the population. In 2021, 7.6% of Norwegians above 16 years old reported to have been hunting, while 41.6% had been harvesting berries and mushrooms (SSB, 2021a). Although harvesting timber⁵ may also embody relational values for some users, harvest is currently done mostly by machines, with few people involved (SSB, 2015), undermining the significance of relational aspects if compared to e.g., hunting. Moreover, people may seek recreation and aesthetic experiences from forests primarily to gain pleasure (instrumental values), while closeness to forest may also be important elements of people's identity and social cohesion (relational values) (Chan et al., 2016).

3.2.2. Statistical analysis

In total, 3076 local inhabitants answered the survey, fully or partially. We filtered out all respondents that did not complete the survey, which left a final sample size of 1694 respondents. We used the open-source statistics program Jasp for the statistical analysis, following three steps: i) retrieving descriptive statistics, ii) analysis of variance (ANOVA), and iii) an exploratory factor analysis to retrieve broad values which we used for examining correlations with specific forest values.

First, we retrieved descriptive statistics (with mean) on the appreciation of each of the 9 forest ecosystem services, as well as for the two statements: "Forest in my municipality means a lot to me" [importance] and "I get to actively participate in decisions regarding forest in my municipality" [participation].

Second, we conducted initial linear regressions of all socio-demographic variables related to each forest ecosystem service, and the two statements transcribed above. Gender and forest ownership stood out as two key determinants, and we used these variables for further analysis of variance. Gender has been found to be an important determinant for the value ascribed to ecosystem services (Calvet-Mir et al., 2016) and for public environmental concern (Liu et al., 2014), while private ownership is an important marker of institutional context (Vatn, 2015). We used Post Hoc Tests to confirm whether the identified differences were significant, and we retrieved mean, standard deviation, mean difference, and P-value (P-tukey). With regard to 'importance' and 'participation', we also examined variance between forest owners with different sized forest properties.

⁴ The 175 written replies to this question indicated that respondents expressed their own opinion on forests importance for them and their community, as opposed to attempting to conduct some objective assessment.

⁵ "Harvesting of timber" was perceived as distinct from harvesting of firewood – which many respondents mentioned as an additional important ecosystem services in their written replies.



Fig. 1. Municipalities sampled in the survey, Southern Norway, 2021–2022, Source (©norgeskart.no, 2022). Circle size indicates sample size as small ($n \leq 130$) or large ($n \geq 130$).

Table 1
Overview of population and share of forest area in each municipality.

		Forest, percent of unbuild land area	Forest, km ² of unbuild land area	Total km ² of unbuild land area	Population in 2022
Communities with less active forestry	Solund	7.6%	17.14	225.22	768
	Vang	12.3%	184.45	1495.45	1310
	Bykle	17.2%	250.48	1456.89	935
	Askvoll	22%	70.64	320.51	2951
	Fjaler	48%	197.22	409.87	2901
	Engerdal	48%	1048.23	2184.56	1253
Forestry communities	Hyllestad	53%	134.55	253.86	1290
	Rendalen	54.9%	1734.75	3160.54	1722
	Sør-Aurdal	71.4%	777.86	1089.01	2889
	Grue	80.5%	658.59	817.86	4548

Source: (SSB, 2023a). Solund and Bykle are two of the least populated municipalities in Norway. The low percentage of forest is due to these communities being an island community in the far west of Norway (Solund) and a mountain community (Bykle).

Third, we did an exploratory factor analysis across the general questions about social, environmental, and economic sustainability. From this analysis, we identified two factors⁶ that reflected contrasting broad values. The first broad value was identified as perceiving economic and societal progress as superior to nature responsibility, while the second broad value entails seeing responsibility towards nature as a guiding principle (see Table A.2 in Appendix). Next, we retrieved Spearman’s rho on correlations between holding one of these two broad values and appreciating specific forest ecosystem services.

3.3. Interviews and institutional analysis

We used the Environmental Governance Systems framework (Fig. 3) (Vatn, 2015, 2021) as an analytical framework to identify and examine the most prominent actors, VAI’s, and broad values of Norwegian forest governance.

Economic actors are defined here as those holding rights to productive resources, such as forestry owners or forestry operators, while political actors are those defining the resource regimes and the rules for the

political process (such as ministries or municipalities). Civil society actors are defined as those that offer legitimacy to political actors and formulate the normative basis of a society (Vatn, 2015:143). We make a distinction between formal civil society actors and the citizen-side of civil society. The former is comprised of organizations with formal structures (such as NGO’s, mass media, university and research institutes, political parties, and organizations representing business). The latter represents the general citizen (e.g., all citizens in a municipality). There are significant overlaps between the different groups of actors. The same person can both be a political, economic, and a civil society actor – and all actors are indeed also citizens. The actor categories are thus ‘roles’, that can be useful for analytical purposes (Vatn, 2015).

We conducted thirteen interviews with knowledge producers working in research institutes or universities (formal civil society actors), and two field interviews with representatives from Oslo municipality and Sør-Aurdal municipality. Due to safety measures related to the Covid pandemic, most interviews were conducted digitally, except for the two field interviews. The interviews were in-depth and semi-structured and lasted 1 to 1 ½ hour each (see semi-structured interview guide in Appendix, Table A.3.).

We assessed the arrangements of each dominant value-articulating institution, following these criteria: i) who gets to participate, and in

⁶ Both of these factors had internal reliability above 0.7 on Cronbach’s α [α].

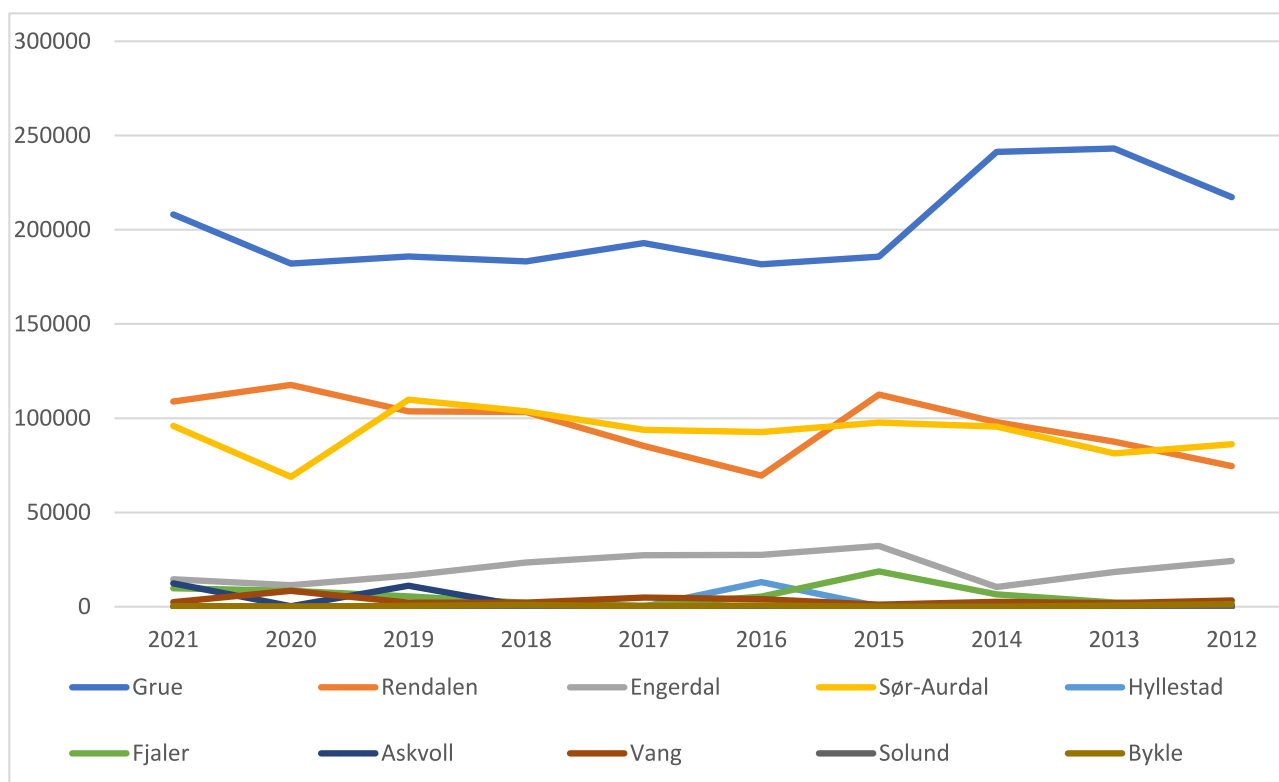


Fig. 2. Overview of timber harvested for sale (m³) in the different municipalities, 2012–2021. The tree species harvested are primarily spruce, followed by pine, and occasionally also some deciduous trees (typically birch) (SSB, 2023b).

Table 2
Categorization of forest ecosystem services in the survey.

Type of forest ecosystem service	Ecosystem service category	Specific values
Biodiversity: Home for animals and biodiversity	Supporting	Intrinsic
Inspiration: Inspiration for arts, culture, and literature	Cultural	Relational
Spirituality: Spiritual values	Cultural	Relational
Aesthetical: Aesthetical (the landscape brings joy)	Cultural	Relational (instrumental)
Recreation: Outdoor recreation	Cultural	Relational (instrumental)
Harvesting: Harvesting of berries, mushrooms, and wild plants	Provisioning (cultural)	Instrumental (relational)
Hunting: Access to hunting and game resources	Provisioning (cultural)	Instrumental (relational)
Timber: Harvesting of timber	Provisioning	Instrumental
Carbon: Sequestration and storage of carbon	Regulating	Instrumental (intrinsic)

The secondary relation of each service to type of value is indicated in parenthesis.

which capacity or actor-role (e.g., as consumers, citizens, stakeholder representatives, or experts)?, ii) how is the process defined (e.g., are participants expected to contribute as individuals or as a group, and are values seen as given, or as results of the specific process)?, iii) how are values expected to be expressed (e.g., as prices or as arguments, and is account taken for values that are incommensurable)?, and iv) which forms do recommendations and conclusion take; are they e.g., based on an aggregation of individually articulated values, or on a common consideration of arguments? (Vatn, 2021:185).

4. Results

4.1. Survey results

Table A.4. in Appendix gives an overview of the number and proportion of respondents by different socio-demographic characteristics, while Table A.1. provides results for the general questions about social, environmental, and economic sustainability.

4.1.1. Importance of forest and forest ecosystem services

Respondents rank recreation (M = 4.325), biodiversity (M = 4.022), and aesthetics (M = 3.981) as the most important forest ecosystem services for themselves and their community (Table 3). The importance of forests for spirituality (M = 2.059) is ranked the lowest, followed by inspiration for arts, culture, and literature (M = 2.585), and harvesting of timber (M = 3.244). Next, although 70.8% of respondents deem that the forest in their municipality is important for them, only 11.2% consider that they get to participate actively in local governance.

Table A.5. in Appendix. provide an overview of appreciation of forest services in each municipality, while Table 4 shows differences across the two categories of communities. With the exception of hunting (no difference), all services are ranked significantly higher in the 'forestry communities'. The largest different is found in the appreciation of timber (MD = 0.732). However, the ranking of services remains mostly the same, except that in the forestry communities, aesthetics is ranked marginally higher than biodiversity, while carbon swap places with hunting.

Overall, supporting and cultural services are ranked highest, while provisioning services that also include recreational aspects (such as harvesting and hunting) are ranked higher than services with a more

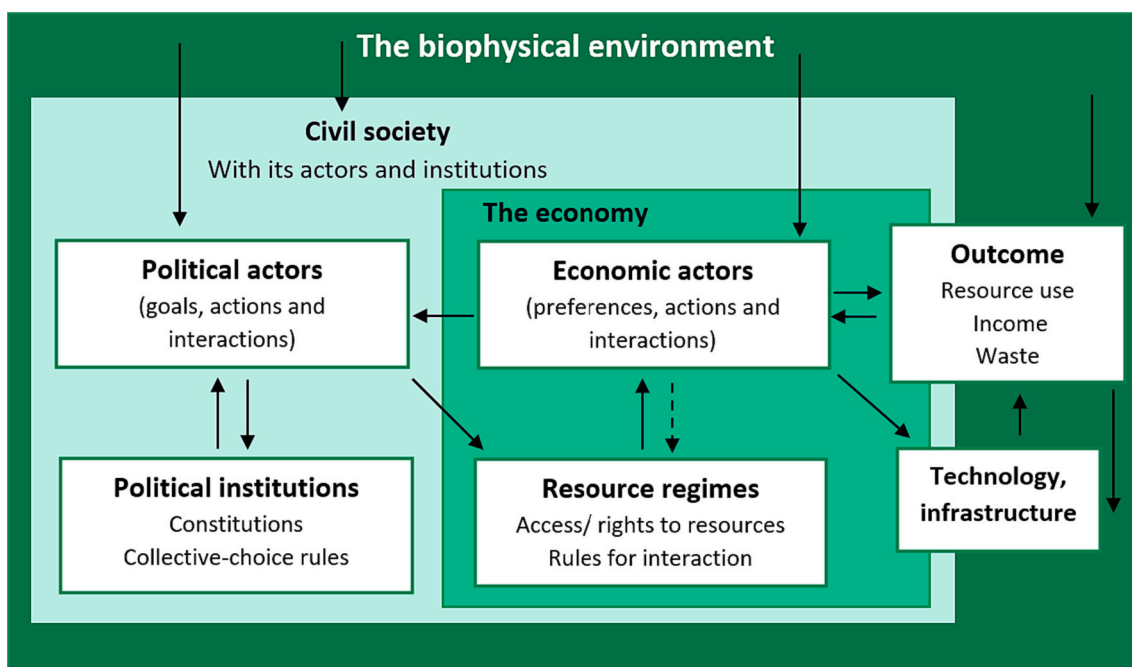


Fig. 3. Integrated framework illustrating the interaction between ecological, political, and economic processes (Vatn, 2021).

Table 3

Appreciation of forest ecosystem services, and participation in forest governance, Southern Norway, 2021–2022.

	Mean (M)	Std. dev. (SD)	Degree of perceived importance				
			Very important 1	2	3	4	Not important 5
Recreation	4.325	0.982	58.7%	23.4%	12.2%	3%	2.7%
Biodiversity	4.022	1.086	43.6%	28%	18.6%	6.4%	3.4%
Aesthetics	3.981	1.138	43.1%	27.5%	18.6%	5.8%	5%
Harvesting	3.792	1.148	34.2%	29.3%	22.7%	9%	4.8%
Hunting	3.773	1.303	39.6%	25.2%	17.7%	8%	9.5%
Carbon	3.559	1.239	29.8%	22.8%	29%	10.3%	8.1%
Timber	3.244	1.324	21.8%	21.6%	28.3%	13.9%	14.4%
Inspiration	2.585	1.276	9.5%	14.5%	27.2%	22.6%	26.2%
Spirituality	2.059	1.293	7.2%	8.9%	19%	16.1	48.8%
Degree of agreement to statement							
	Mean	Std. dev.	Agree (1)	Agree some	Neutral	Disagree some	Disagree (5)
Importance	3.963	1.120	42%	28.8%	18.3%	5.5%	5.4%
Participation	2.419	1.146	4.3%	6.9%	45.9%	12.2%	30.7%

See ‘importance’ and ‘participation’ described in Section 3.2.2.

distinct instrumental character (such as timber). These results are in line with reports showing that outdoor recreation is very important to Norwegians (MCE, 2016; MCE, 2018; NEA, 2020), and that material connections between forests and communities are waning (Helseth et al., 2022). The low ranking of inspiration for arts, culture, and literature may be related to this waning material connections, as Norwegian arts and literature emerging from human-forest relations have traditionally been closely connected to material uses of forests (Kaldal, 2022).

4.1.2. Differences across socio-demographic characteristics

Our results indicate that the appreciation of forest ecosystem services varies by the socio-demographic characteristics of forest ownership and gender (Table 5).

First, women appreciate all forest ecosystem services significantly higher than men, except from timber and hunting. Specifically, women appreciate harvesting (MD = 0.450), inspiration (MD = 0.382), spirituality (MD = 0.352), aesthetics (MD = 0.340), biodiversity (MD = 0.306), recreation (MD = 0.249), and carbon (MD = 0.199), significantly higher than men. However, women have less appreciation for timber than men (MD = - 0.143), while there are no significant gender

differences with regards to hunting.

Overall, these results indicate that men in the study areas have higher appreciation for instrumental values (embodied in the provisioning ecosystem services of timber), while women show higher appreciation for relational and intrinsic forest values (embodied in services such as inspiration and spirituality). These results are interesting in light of the traditionally strong male-dominance of Norwegian (and European) forest governance, in which female views and values have been restrained (Follo et al., 2017; Kaldal, 2022). These results also align with previous research, e.g., showing that women emphasize different ecosystem services than men (Calvet-Mir et al., 2016), and that women mobilize intrinsic and relational values in forest governance (Agarwal, 2009).

Second, forest owners rank the importance of forests for timber (MD = 0.542), hunting (MD = 0.437), biodiversity (MD = 0.162), and harvesting (MD = 0.133) significantly higher than non-forest owners. Furthermore, forest owners rank spirituality (MD = - 0.177) and inspiration (MD = - 0.146), significantly lower than non-forest owners. These results indicate that forest owners overall hold higher appreciation for both provisioning and supporting services, and thus both for instrumental and intrinsic values. When controlling across gender, we

Table 4

Appreciation of forest ecosystem services in ‘forestry communities’ and in ‘communities with less active forestry’, Southern Norway, 2021–2022.

	Communities with less active forestry (N = 1136)		Forestry communities (N = 556)		Mean diff.	Significance P-value
	Mean	Std. dev.	Mean	Std. dev.		
Recreation	4.235	1.039	4.509	0.824	0.274	< 0.001***
Biodiversity	3.955	1.130	4.158	0.977	0.203	< 0.001***
Aesthetics	3.887	1.182	4.173	1.016	0.286	< 0.001***
Harvesting	3.683	1.196	4.014	1.008	0.332	< 0.001***
Hunting	3.781	1.277	3.757	1.356	0.042	0.722
Carbon	3.458	1.241	3.766	1.211	0.308	< 0.001***
Timber	2.984	1.278	3.716	1.281	0.732	< 0.001***
Inspiration	2.443	1.234	2.876	1.311	0.433	< 0.001***
Spirituality	2.037	1.265	2.214	1.334	0.177	< 0.008**
Important	3.771	1.196	4.356	0.918	0.585	< 0.001***
Participation	2.385	1.080	2.489	1.197	0.104	0.072

Bold indicates significant differences in "mean" across the two groups of respondents.

Table 5

Appreciation of forest ecosystem services by forest ownership and gender, Southern Norway, 2021–2022.

	Women		Men		Mean diff.	Significance P-value
	Mean	Std. dev.	Mean	Std. dev.		
Recreation	4.466	0.922	4.197	1.023	0.249	< 0.001***
Biodiversity	4.168	1.014	3.862	1.135	0.306	< 0.001***
Aesthetics	4.142	1.076	3.802	1.176	0.340	< 0.001***
Harvesting	4.003	1.062	3.553	1.197	0.450	< 0.001***
Hunting	3.771	1.308	3.777	1.295	-0.005	0.937
Carbon	3.657	1.199	3.457	1.271	0.199	< 0.001***
Timber	3.156	1.318	3.299	1.328	-0.143	0.027*
Inspiration	2.761	1.273	2.379	1.247	0.382	< 0.001***
Spirituality	2.256	1.333	1.904	1.217	0.352	< 0.001***
Important	4.016	1.131	3.913	1.158	0.102	0.067***
Participation	2.367	1.067	2.479	1.178	-0.112	0.041*

	Forest owner		Non-forest owner		Mean diff.	Significance P-value
	Mean	Std. dev.	Mean	Std. dev.		
Recreation	4.384	0.900	4.305	1.007	0.078	0.157
Biodiversity	4.144	1.011	3.982	1.107	0.162	0.008**
Aesthetics	3.947	1.134	3.991	1.140	-0.044	0.492
Harvesting	3.892	1.107	3.759	1.160	0.133	0.040*
Hunting	4.104	1.142	3.666	1.334	0.437	<0.001***
Carbon	3.638	1.205	3.533	1.249	0.105	0.135
Timber	3.633	1.249	3.091	1.321	0.542	<0.001***
Inspiration	2.475	1.263	2.621	1.278	-0.146	0.042*
Spirituality	1.962	1.255	2.139	1.303	-0.177	0.015*
Importance	4.153	1.022	3.901	1.177	0.253	<0.001***
Participation	2.847	1.144	2.280	1.077	0.567	<0.001***

Gender: responses in categories ‘Neither’ (N = 3) and ‘Do not want to say’ (N = 11) were filtered out for the comparison across on gender, as numbers were too small for reasonable margin of error. Forest owners (N = 417), with 45.8% women (N = 191) and 54.2% men (N = 226). Bold indicates significant differences in "mean" across the two groups of respondents.

Table 6

Comparison of ‘participation’ and ‘importance’ among forest owners and non-forest owners in the two groups of communities, Southern Norway, 2021–2022.

Forest owners						
	Communities with less active forestry, (N = 272)		Forest communities, (N = 145)		Mean diff.	Significance P-value
	Mean	Std. dev.	Mean	Std. dev.		
Importance	3.926	1.111	4.579	0.642	0.653	<0.001***
Participation	2.728	1.041	3.069	1.289	0.341	0.004**

Non-forest owners						
	Communities with less active forestry, (N = 866)		Forest communities, (N = 411)		Mean diff.	Significance P-value
	Mean	Std. dev.	Mean	Std. dev.		
Importance	3.722	1.218	4.277	0.986	0.556	<0.001***
Participation	2.277	1.070	2.285	1.093	0.008	0.907

Bold indicates significant differences in "mean" across the two groups of respondents.

Table 7

Size of property, importance of forests and degree of experienced participation, Southern Norway, 2021–22.

	Importance				Participation			
	0.5–10 ha	10–50 Ha	50–200 ha	200+ha	0.5–10 ha	10–50 ha	50–200 ha	200+ ha
Valid	69	123	133	92	69	123	133	92
Mean	3.957	4.057	4.150	4.435	2.449	2.870	2.812	3.163
Std. Deviation	1.104	0.986	1.026	0.953	1.008	1.040	1.129	1.303
P-value (ANOVA)	0.013**				0.001***			

Table 8

Broad values by gender and forest ownership, Southern Norway, 2021–2022.

	Women		Men		Meandiff.	Significance P-value
	Mean	Std.dev	Mean	Std.dev.		
Progress superior to nature responsibility	3.062	0.822	3.296	0.920	-0.234	<0.001***
Responsibility towards nature	4.183	0.628	3.892	0.748	0.291	<0.001***

	Forest owner		Non-forest owner		Mean diff.	Significance P-value
	Mean	Std. dev.	Mean	Std. dev.		
Progress superior to nature responsibility	3.215	0.923	3.156	0.860	0.059	0.232
Responsibility towards nature	4.059	0.706	4.010	0.689	0.049	0.215

Bold indicates significant differences in "mean" across the two groups of respondents.

found that the difference related to spirituality only appears between female non-forest owners ($N = 706$, $M = 2.310$) and female forest owners ($N = 191$, $M = 2.021$), with a mean difference of -0.299 . There is no significant difference observed between forest owners ($N = 557$, $M = 1.901$) and non-forest owners among males ($N = 226$, $M = 1.921$). This may indicate that the context of being a forest owner more strongly alters the relational values held and expressed by women.

Forests are also significantly more important to forest owners ($MD = 0.253$), and owners feel that they get to participate more actively in forest governance ($MD = 0.567$) than non-forest owners. Moreover, forest owners ($M = 4.568$) and non-forest owners ($M = 4.266$) in forestry communities consider forest significantly more important than forest owners ($M = 3.893$) and non-forest owners in communities with less active forestry ($M = 3.741$) (Table 6). The 'gap' between experienced participation in forest governance is larger between forest owners and non-forest owners in the forestry communities ($MD = 0.792$), than in the communities with less active forestry ($MD = 0.501$). Overall, non-forest owners in 'forestry communities' care very highly about forests ($M = 4.277$), but they do not feel empowered in forest governance ($M = 2.285$).

Results also vary with the size of forest property (Table 7). As an example, those owning >200 ha of forests feel more empowered than those owning 0.5 – 10 ha ($MD = 0.714$).

4.1.3. Relationship between broad values and specific forest values

Perceiving economic and social *progress as superior to nature responsibility*, correlates negatively (Spearman's rho, S_r) with appreciation of most forest ecosystem services, except for hunting and timber, for which there is a positive correlation (Table A.6. in Appendix). The most significant negative correlation is found with carbon ($S_r = -0.281$), biodiversity ($S_r = -0.271$), inspiration ($S_r = -0.235$), and spirituality ($S_r = -0.219$). Holding broad values of responsibility towards nature, however, correlates significantly positive with most forest ecosystem services. The most significant positive correlations are with biodiversity ($S_r = 0.429$) and aesthetics ($S_r = 0.403$). Hunting has the weakest positive correlation ($S_r = 0.105$), while timber has no correlation.

These results indicate that broad values aligned with *nature responsibility* underpin intrinsic and relational values, while those that see

progress as superior to nature responsibility favor instrumental values. We also found (Table 8) that women state higher levels of *responsibility towards nature* ($MD = 0.291$) and are less inclined to perceive economic and societal *progress as superior to nature responsibility* ($MD = -0.234$). These results align with previous research showing gender differences in environmental attitudes (Liu et al., 2014). Moreover, while forest owners rank services embodying instrumental values high, they score similar as average respondents on the two broad values. This may indicate that forest owners perceive governing forests for increased timber production as the most responsible way to care for forests.

4.2. Institutional arrangements shaping forest values

We identified the main VAI's affecting decisions of Norwegian forest governance to be: i) timber-markets, ii) cost-benefit analysis, iii) forestry plans, and iv) municipal planning processes. We assessed each VAI following the criteria outlined in Section 3.3. (see detailed results in Table A.7. in Appendix).

First, *timber-markets* have a long-standing dominance in shaping how values are articulated in Norwegian forest governance (Helseth et al., 2022). Timber prices are today defined by international timber markets, with few regulations (Tomter and Dalen, 2018). Such markets are dominated by broad values of utility and efficiency. Regarding specific values, instrumental values hold prominence. However, voluntary and market-based forestry certification schemes (promoting plural values) have been developed and implemented over the last decades, in dialog between forestry actors and civil society actors such as e.g., environmental NGO's (Tomter, 2023). The ability of the general citizen to shape forest values in timber markets is restricted to their role as consumers.

Second, *cost-benefit analysis* (CBA) inform larger state-led infrastructure development projects in forest areas, such as public roads or powerlines (NOU 1998:16; Sirnes et al., 2021). The aim of CBA is to inform decision aimed at maximizing overall net societal utility and secure efficient resource use. Through CBA, the values of different forest ecosystem services (such as timber, biodiversity, or recreation) are standardized (often in monetary terms) and compared to societal benefits or costs of infrastructure developments. Such analyses are typically

done by experts. They may draw on surveys of e.g., willingness to pay (WTP) emphasizing people's consumer preferences and assuming commensurability of forest values which facilitate aggregation of data (Sirnes et al., 2021). Hence, beyond their role as consumers (expressions of WTP), CBA enables limited space for the general citizen to engage in and shape the values that currently dominate Norwegian forest governance.

Third, private forest owners are encouraged to develop a *forestry plan* that balance the long-term management of timber resources with environmental considerations. Guidelines for forestry plans are flexible (Lovdata, 2004), and the development of plans typically rely on inputs from forest owner companies and municipal administrations (Norges skogeierforbund, 2023). The main broad values dominating forestry plans are *utility* and *efficiency* in timber production, while negative effects on e.g., biodiversity and recreation are to be minimized. Instrumental values are mobilized, and the general citizen have no specified role in developing or approving private forestry plans (Lovdata, 2004).

Fourth, *municipal planning processes* regulate infrastructure development in forest areas, such as public roads, recreational homes, and urban development. Municipal planning is guided by procedural steps in the Planning and Building Act (PBA), which e.g., entails specific requirements for: i) impact assessments (IA), and ii) participation (Lovdata, 2008).⁷ *Impact assessments* are required for projects with significant effects on environment and society, and should e.g., include considerations of ecosystem services (Lovdata, 2017). IA's can mobilize intrinsic values through the use of biophysical indexes as independent valuation metrics, such as the Norwegian Nature Index (Certain et al., 2011; Jakobsson and Pedersen, 2020). However, besides recent mapping of important areas for recreation (NEA, 2014), there is a lack of formal data and indicators on cultural ecosystem services embodying relational values (Helseth et al., 2022). *Deliberative processes* (e.g., public meetings, open hearings) are required for some steps of municipal planning, but not on issues of forest governance, and there are no clear guidelines on how to equitably integrate plural values of forests (Lovdata, 2008). Furthermore, both IA and deliberative processes frame participation primarily towards those that are clearly defined stakeholders, as opposed to general citizens.

Our evaluation of the institutional arrangements affecting Norwegian forest governance, indicates that prevailing VAI's are expert-dominated, emphasizing instrumental values of forests (especially timber), or, to a less extent, intrinsic values (such as protecting biodiversity as an end in itself). We were not able to identify any presently used VAI's that clearly mobilize relational values of forests (such as recreation, place attachment, spirituality, and inspiration), or that empower actors emphasizing such values. Results also indicate that community involvement is rarely encouraged.

Overall, our results indicate that redesigning the VAI's guiding Norwegian forest governance is key to even out value asymmetries related to gender and ownership, and to mobilize plural values. This seems particularly important in 'forestry communities', where the gap between forest owners and non-forest owners perceived participation is largest. In particular, the role of PBA in issues of forest governance should be clarified and improved, with emphasis on multicriteria valuation and on inviting public participation through deliberative processes.

5. Conclusion

We drew on theory from institutional and ecological economics to understand the role of social preferences, institutional arrangements, and power dynamics in defining which and whose values are mobilized

⁷ However, infrastructure developments related to forestry (such as logging roads), are seen to be guided by the Forestry Act, which causes unclarity with regards to requirements for impact assessments and participation (Forskning.no, 2022).

or inhibited in Norwegian forest governance. Following our research questions, four main findings are highlighted.

First, most respondents rank ecosystem services that embody relational and intrinsic values (such as recreation and biodiversity) higher than services that primarily embody instrumental values (timber), and this ranking of services is similar across 'forestry communities' and communities with less active forestry. Second, women and non-forest owners show higher appreciation for relational values than men and forest owners. We also find that holding a broad value of "responsibility towards nature" underpin the appreciation of ecosystem services embedding intrinsic and relational values of forest, while perceiving progress as superior to nature responsibility corresponds with appreciating ecosystem services that embody instrumental forest values. Third, dominant value-articulating institutions, such as timber markets and cost-benefit analysis, favor utility, efficiency, and instrumental values. Finally, few participatory arenas for decision-making are available, and, except for those who own relatively large forest properties, local actors do not feel empowered in decision-making regarding forest ecosystems in their municipality.

Our results indicate that gender as well as property ownership and size are important markers of power in Norwegian forest governance. The existing governance regime empowers actors prioritizing instrumental values (especially forest owners), and, to a less extent, actors stewarding intrinsic values (e.g., environmental NGO's). The opportunity to express relational values associated with ecosystem services such as spirituality, inspiration, and aesthetics, are mostly restrained, and actors holding such values are largely disempowered. Balancing and diversifying nature's values may thus involve empowering socio-demographic groups whose values have been left aside, with particular emphasis on women, smallholders, and non-forest owners. The large gap in perceived 'participation' between non-owners and owners in the forestry communities indicate that efforts to empower non-forest owners are particularly important in communities with active forestry.

Our analysis identifies possibilities to promote a broader array of forest ecosystem services and values through more inclusive forest governance approaches, less dominated by markets and experts, and through enabling planning processes characterized by deliberation. This may require government actions to expand participatory power beyond forest owners, market actors, and NGOs, to engage the wider civil society in rural areas. This can be done through redesigning important value-articulating institutions with emphasis on promoting relational and intrinsic values, and through developing guidelines for multicriteria valuation. Specifically, the role of the Planning and Building Act in issues of forest governance should be clarified and strengthened, with emphasis on deliberative processes related to forest governance.

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

The statistical data from the survey is available upon request. The data from the in-depth interviews is confidential.

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Appendix

Table A.1

Results from closed survey questions on issues of social, environmental, and economic sustainability, Southern Norway, 2021–2022.

	Mean (M)	Std. dev. (SD)	Disagree (1)	Disagree some	Neutral	Agree some	Agree (5)
I feel included and involved in the local community where I live	4.119	1.164	4.7%	7.1%	13%	22%	53.2%
The landscape and nature in the municipality mean a lot to my identity	4.441	0.890	2.1%	1.9%	9.1%	23.7%	63.2%
I am engaged in the development of the municipality	4.170	0.985	2.7%	3.8%	13.8%	33.2%	46.5%
I wish to live in the municipality in the future	4.311	1.089	3.2%	6%	11.3%	15.6%	63.9%
It doesn’t matter much to me where I live, and I might as well live somewhere else	2.342	1.350	38.4%	22%	14.8%	16.5%	8.3%
I can be myself fully in my municipality	4.047	1.235	5.9%	9.4%	10.4%	22.7%	51.6%
We must focus on densification of the townships rather than scattered settlements	2.315	1.375	41.6%	18.2%	16.6%	14.3%	9.3%
If we do not get the population to grow, our local community will die out in the future	3.887	1.184	6%	9.6%	11.6%	35.3%	37.5%
Immigration from other countries is positive for the municipality	3.868	1.208	6.5%	7.7%	18.4%	27.3%	40.1%
There is too much talk about increasing the population, and those who already live here are forgotten	3.448	1.266	10.8%	13%	19%	34.9%	22.3%
Good health and quality of life should be a measure of social development, in the same way as GDP (gross domestic product)	4.433	0.784	0.7%	1.3%	10.2%	29.5%	58.3%
Social challenges are “drowned” in the focus on climate and environmental problems	3.646	1.198	8%	8.4%	22.3%	33.6%	27.7%
The municipality should purchase goods and services from local providers	4.504	0.793	1.1%	1.5%	7.7%	25.3%	64.4%
Climate change creates challenges in my local community	3.021	1.260	17.8%	13.3%	29.5%	27.8%	11.6%
There is an exaggerated focus on climate and the environment	2.973	1.445	23.5%	15.8%	20%	21.3%	19.4%
Sustainable development entails that we must be willing to change our way of life	3.700	1.182	7.5%	8.5%	18.9%	36.8%	28.3%
We must take better care of nature because it forms the basis of our lives	4.335	0.929	2.2%	2.7%	10.4%	28.6%	56.1%
Technological development will be able to solve most environmental challenges	2.744	1.113	16.5%	23.3%	34.4%	20.7%	5.1%
Nature has a value in itself, and we have an ethical responsibility to take good care of nature	4.548	0.772	1.1%	1.1%	7.7%	22.3%	67.8%
I feel that I get to influence the type of business and economic value creation we have in the municipality	2.551	1.144	25.7%	16.4%	39.2%	14.3%	4.3%
It is a problem that businesses in the municipality meets too many climate and environmental requirements	2.969	1.207	16.6%	13.3%	38.1%	20.7%	11.3%
We should better facilitate for new, green businesses	3.837	1.097	5.3%	4.4%	25%	32.2%	33.2%
The economic value creation should stay in the rural municipalities, where the natural resources are found	4.250	0.927	1.5%	1.7%	19.2%	25.3%	52.2%
The business community in my municipality is driving a more sustainable development	3.136	0.993	7.4%	11.5%	50.6%	20.9%	9.6%
Conservation of nature contributes positively to business developments and provides increased value creation	3.183	1.239	13%	12.8%	34.4%	22.4%	17.4%
Continued economic growth is a precondition for me to live with good quality of life	3.452	1.227	10.4%	9%	28.3%	29.6%	22.7%

Table A.2

Factors identified from survey statements.

Economic and societal progress is superior to nature responsibility	Responsibility towards nature as a guiding principle
It is a problem that businesses in the municipality meets too many climate and environmental requirements	Nature has a value in itself, and we have an ethical responsibility to take good care of nature
Social challenges are “drowned” in the focus on climate and environmental problems	We must take better care of nature because it forms the basis of our lives
There is an exaggerated focus on climate and environmental issues	The landscape and nature in the municipality mean a lot to my identity
Continued economic growth is a precondition for me to live with good quality of life	Sustainable community development entails that we must be willing to change our way of life
REV_ Conservation of nature contributes positively to business developments and provides increased value creation	Conservation of nature contributes positively to business developments and provides increased value creation
Cronbach’s a: 0.729	Cronbach’s a: 0.732

Table A.1.: Both factors were tested for unidimensional reliability using Cronbach’s a, for which above 0.7 was considered sufficiently reliable. The available responses to each of the statements were: disagree (1) – disagree some (2) – neutral (3) – agree some (4) – agree (5). REV = reversed statement.

Table A.3

Semi-structure interview guide.

Presentation of the research project (ECOREAL)

- The project’s purpose and organization
- Underline the informant’s rights
- Ask about future use of data

(continued on next page)

Table A.3 (continued)*About the informant*

- The informant introduces her/himself (background and current role)
- What does the forest mean to you?
- What is your role in [organization] and how long have you worked there?

The organization of the forest governance field

- What is the condition/state of Norwegian forest?
- What is the forest like as a political arena?
- Who works together and how does this take place?
- Whose opinions are heard?
- Which role does local communities play in forest governance today? (With *local communities* we e.g., think of a municipality, but perhaps primarily the general citizens of a municipality - do they have a role in forest management? Do you think role should be any different?)
- Do you feel that there is any discussion about the role of local communities/civil society in forest management?

Forestry

- How is the forest managed today?
- How should the forest be managed, and why?
- What are drivers and barriers for change?

The forest's contribution to sustainable community development

- What does the forest mean to Norwegian local communities? (Has the importance of the forest changed in the last 50 years? In what way?)
- What are the most important values that the forest contributes to our society? (Are these values recognized?)
- Do you have examples of cases that you believe illustrate well that different values from forests are safeguarded in decision-making processes? (Or the opposite; that different values from forests are not recognized or included in decision-making processes?)
- What comes to your mind when you hear the word "bioeconomy"? From your perspective, what is the forest's role in a possible bioeconomy? (Do we have to make some trade-offs, or may all aims for the forest be achieved?)

Other

- Did we forget something?
- Who else should we talk to?

Table A.4

Overview of respondents by different socio-demographic characteristics.

Variable	Categories	Counts	Total	Porportion
Gender	Male	783	1694	0.462
	Female	897	1694	0.530
	Other	3	1694	0.002
	Do not want to say	11	1694	0.006
Age	13–15	67	1694	0.040
	16–19	37	1694	0.022
	20–24	50	1694	0.030
	25–34	224	1694	0.132
	35–49	507	1694	0.299
	50–66	613	1694	0.362
	67–75	151	1694	0.089
	76+	45	1694	0.027
Municipality	Bykle	72	1694	0.043
	Vang	319	1694	0.188
	Hyllestad	102	1694	0.060
	Askvoll	197	1694	0.116
	Fjaler	252	1694	0.149
	Solund	100	1694	0.059
	Grue	344	1694	0.203
	Engerdal	96	1694	0.057
	Sør-Aurdal	144	1694	0.085
	Rendalen	68	1694	0.040
Years lived in the municipality	<1 year	38	1694	0.022
	1–2 years	51	1694	0.030
	3–4 years	65	1694	0.038
	5–14 years	272	1694	0.161
	15 years or more	1268	1694	0.749
Owns forest	Yes	417	1694	0.752
	No	1263	1694	0.248

(continued on next page)

Table A.4 (continued)

Variable	Categories	Counts	Total	Porportion
Highest level of education	Elementary school	56	1590	0.035
	Vocational school	164	1590	0.103
	High school	462	1590	0.291
	College/university up to 3 years	501	1590	0.315
	College university 3 years+	407	1590	0.256
Personal income (NOK/Y)	Up to 150,000	20	1590	0.013
	150,000–249,999	68	1590	0.043
	250,000–349,999	159	1590	0.100
	350,000–449,999	229	1590	0.144
	450,000–559,999	329	1590	0.207
	550,000–649,999	474	1590	0.298
	750,000 +	145	1590	0.091
	1 mill +	80	1590	0.050
	Do not know/ do not want to say	86	1590	0.054

Proportion adds up to 100% within each category. Those in the age groups between 13 and 19 did not get questions about education and income.

Table A.5

Appreciation of different forest services by municipality.

Home for animals and biodiversity										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	4.569	3.978	3.931	3.807	3.996	3.330	4.189	4.292	4.007	4.324
Std. Deviation	0.784	1.161	1.110	1.103	1.095	1.288	0.976	0.857	1.054	0.762
Inspiration for arts, culture, literature										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	2.806	2.508	2.412	2.310	2.313	2.230	2.988	2.823	2.750	2.574
Std. Deviation	1.380	1.308	1.146	1.139	1.221	1.171	1.316	1.114	1.260	1.342
Carbon sequestration and storage										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	3.625	3.483	3.314	3.406	3.651	2.920	3.776	3.563	3.701	3.853
Std. Deviation	1.368	1.310	1.202	1.119	1.159	1.292	1.195	1.186	1.317	1.055
Harvesting berries, mushrooms ect.										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	4.153	3.749	3.549	3.467	3.683	3.150	4.023	4.250	3.924	4.162
Std. Deviation	1.134	1.189	1.240	1.163	1.199	1.250	1.024	0.808	1.038	0.840
Hunting										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	3.917	4.060	3.804	3.589	3.702	2.950	3.750	4.198	3.583	4.162
Std. Deviation	1.361	1.274	1.219	1.293	1.225	1.167	1.349	1.012	1.412	1.192
Spiritual values										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	2.194	2.113	2.029	1.919	1.944	1.940	2.369	2.260	2.063	1.750
Std. Deviation	1.390	1.343	1.173	1.218	1.196	1.162	1.389	1.347	1.258	1.125

(continued on next page)

Table A.5 (continued)

Spiritual values										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Harvesting of timber										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	2.306	3.009	2.922	2.964	3.242	2.520	3.602	3.323	3.889	3.926
Std. Deviation	1.307	1.326	1.200	1.247	1.208	1.283	1.290	1.100	1.183	1.386
Recreation										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	4.750	4.245	4.265	4.157	4.278	3.440	4.512	4.656	4.417	4.691
Std. Deviation	0.645	1.008	0.911	1.035	1.019	1.313	0.843	0.708	0.873	0.553
Aesthetical (the landscape brings joy)										
	Bykle	Vang	Hylle-stad	Askvoll	Fjaler	Solund	Grue	Enger-dal	Sør-Aurdal	Rendalen
Valid	72	319	102	197	252	100	344	96	144	68
Missing	0	0	0	0	0	0	0	0	0	0
Mean	4.514	3.931	3.824	3.721	3.948	3.090	4.209	4.344	4.014	4.324
Std. Deviation	0.787	1.177	1.112	1.216	1.123	1.386	1.023	0.819	1.071	0.818

Bold highlights "mean" (for improved readability of the table).

Table A.6

Correlations between appreciation of ecosystem services and factors.

Variable		Progress superior	Nature responsibility
Nature responsibility		-0.598***	-
	p-value	< 0.001	-
Biodiversity	Spearman's rho	-0.271***	0.429***
	p-value	< 0.001	< 0.001
Inspiration	Spearman's rho	-0.235***	0.309***
	p-value	< 0.001	< 0.001
Carbon	Spearman's rho	-0.281***	0.381***
	p-value	< 0.001	< 0.001
Harvesting	Spearman's rho	-0.187***	0.369***
	p-value	< 0.001	< 0.001
Hunting	Spearman's rho	0.052*	0.105***
	p-value	0.031	< 0.001
Spirituality	Spearman's rho	-0.219***	0.273***
	p-value	< 0.001	< 0.001
Timber	Spearman's rho	0.109***	0.019
	p-value	< 0.001	0.443
Recreation	Spearman's rho	-0.147***	0.383***
	p-value	< 0.001	< 0.001
Aesthetical	Spearman's rho	-0.187***	0.403***
	p-value	< 0.001	< 0.001

Table A.7

Important value-articulating institutions (VAIs) for decisions regarding forestry and infrastructure developments in forest areas.

Type of VAI	Participants (in which capacity)	Process	How to express values	Recommendation and decisions	Broad values	Specific values
Timber-markets	EA: forest owners, forest owners' organizations, entrepreneurs (timber producers) PA: ministries/agencies (experts) CSA: knowledge producers, NGOs	Individual participation. Few are involved. Values are seen as given	Monetary. Commensurability e. g., through forest certification.	Aggregation of individually articulated values. Decisions made by EA	Resource management, Utility, efficiency	Instrumental

(continued on next page)

Table A.7 (continued)

Type of VAI	Participants (in which capacity)	Process	How to express values	Recommendation and decisions	Broad values	Specific values
Cost-benefit analysis	(experts or stakeholders) Cit: no participation EA: developers (producers) PA: ministries/agencies, local governments (stakeholders or experts) CSA: NGOs and knowledge producers (experts) Cit: participation only as consumers (WTP)	Expert-led, individual participation. Few are involved. Values are seen as given	Monetary. Ecological indicators. Indicators on cultural uses (e.g., recreational mapping) may be used. Commensurability towards net societal utility	Aggregation of individually articulated values. Decisions made by PA	Resource management, Utility, efficiency	Instrumental
Forestry plans	EA: forest owners (timber producers) PA: municipal administration (experts) CSA: NGOs (stakeholders) Cit: no participation	Individual participation. Few are involved. Values are seen as given	Monetary. Ecological indicators. Indicators on cultural uses (e.g., recreational mapping) may be used	Aggregation of individually articulated values. Decisions made by EA	Resource management, Utility, efficiency	Instrumental
Impact assessments	EA: Forest owners (stakeholders) PA: municipal administration (experts) CSA: NGOs and knowledge producers (experts, stakeholders) Cit: participation (as stakeholders) in some processes	Expert-led, individual participation. Can involve few or be broad processes involving many people. Values are mostly seen as given	Monetary, ecological indicators. Indicators on cultural uses (e.g., recreational mapping) may be used. Few guidelines on integration of plural values	Aggregation of individually articulated values. May involve common consideration of arguments. Decisions made by PA	Resource management	Depends on process, most commonly instrumental
Deliberative processes in municipal planning	EA: stakeholders PA: municipal administration (experts) CSA: NGO's (stakeholders) Cit: participation in some processes	Both individual participation and as groups. Values can both be seen as given, and as result of processes	Few guidelines on integration of plural values	Common consideration of arguments – typically informed by aggregation of individually articulated values. Decisions by PA	Depends on process	Depends on process.

EA = economic actors, PA = political actors, CSA = formal civil society actors, Cit = general citizens. Important sources: [Certain et al. \(2011\)](#); [Framstad et al. \(2022\)](#); [Jakobsson and Pedersen \(2020\)](#); [Lovdata \(2004\)](#); [Lovdata \(2008\)](#); [Lovdata \(2017\)](#); [Norges skogierforbund \(2023\)](#); [Tomter and Dalen \(2018\)](#); [Tomter \(2023\)](#).

References

- ©norgeskart.no, 2022. Available at: <https://www.norgeskart.no/#!?project=norgeskart&layers=1002&zoom=3&lat=7197864.00&lon=396722.00> (accessed: 31.20.22).
- Agarwal, B., 2009. Gender and forest conservation: the impact of women's participation in community forest governance. *Ecol. Econ.* 68 (11), 2785–2799.
- Altinget, 2023. Skogbruk uten rettslig kontroll. Available at: <https://www.altinget.no/artikkel/jurister-skogbruk-uten-rettslig-kontroll> (accessed: 30.05.23).
- Anderson, C.B., Athayde, S., Raymond, C.M., Vatn, A., Arias, P., Gould, R.K., Kenter, J., Muraca, B., Sachdeva, S., Samakov, A., Zent, E., Lenzi, D., Murali, R., Amin, A., Cantú-Fernández, M., 2022. Chapter 2: Conceptualizing the diverse values of nature and their contributions to people. In: In Balvanera, P., Pascual, U., Christie, M., Baptiste, B., González-Jiménez, D. (Eds.), *Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES secretariat, Bonn, Germany.
- Arias-Arévalo, P., Martín-López, B., Gómez-Baggethun, E., 2017. Exploring intrinsic, instrumental, and relational values for sustainable management of social-ecological systems. *Ecol. Soc.* 22 (4).
- Aspøy, H., Helseth, E.V., 2022. Oppsummering fra dialogforum om mulighetsrommet for ulike driftsformer i skogbruket. 30. mai 2022. In: NINA Rapport 2181. Norsk institutt for naturforskning.
- Aspøy, H., Stokland, H., 2022. Segmented forest realities: the ontological politics of biodiversity mapping. *Environ. Sci. Pol.* 137, 120–127.
- Bækkelund, B., 2020. Den menneskeskapt skogen. Frø, planter og skogkulturarbeid i Norge gjennom 300 år. Flisa Trykkeri AS.
- Bartlett, J., Rusch, G.M., Kyrkjeeide, M.O., Sandvik, H., Nordén, J., 2020. Carbon Storage in Norwegian Ecosystems, Revised edition. Norwegian Institute for Nature Research, Trondheim. NINA Report 1774b:
- Berglihn, E.C., Gómez-Baggethun, E., 2021. Ecosystem services from urban forests: the case of Osloomarka, Norway. *Ecosyst. Serv.* 51, 101358 <https://doi.org/10.1016/j.ecoser.2021.101358>.
- Brockerhoff, E.G., Barbaro, L., Castagneyrol, B., Forrester, D.I., Gardiner, B., González-Olabarria, J.R., Lyver, P.O.B., Meurisse, N., Oxbrough, A., Taki, H., 2017. Forest Biodiversity, Ecosystem Functioning and the Provision of Ecosystem Services. <https://doi.org/10.1007/s10531-017-1453-2>.
- Calvet-Mir, L., March, H., Corbacho-Monné, D., Gómez-Baggethun, E., Reyes-García, V., 2016. Home garden ecosystem services valuation through a gender lens: a case study in the Catalan Pyrenees. *Sustainability* 8 (8), 718. <https://doi.org/10.3390/su8080718>.
- Certain, G., Skarpaas, O., Bjerke, J.-W., Framstad, E., Lindholm, M., Nilsen, J.-E., Norderhaug, A., Oug, E., Pedersen, H.-C., Schartau, A.-K., 2011. The nature index: a general framework for synthesizing knowledge on the state of biodiversity. *PLoS One* 6 (4), e18930. <https://doi.org/10.1371/journal.pone.0018930>.
- Chan, K.M., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez-Baggethun, E., Gould, R., Hannahs, N., Jax, K., Klain, S., 2016. Opinion: why protect nature? Rethinking values and the environment. *Proc. Natl. Acad. Sci.* 113 (6), 1462–1465.
- Dendoncker, N., Keune, H., Jacobs, S., Gómez-Baggethun, E., 2013. Inclusive ecosystem services valuation. In: *Ecosystem Services*. Elsevier, pp. 3–12.
- European Commission, 2021. New EU Forest strategy for 2030. In: *Communication from the Commission to the European Parliament, the Council, The European Economic and Social Committee and The Committee of the Regions*.
- Follo, G., Lidestav, G., Ludvig, A., Vilkruste, L., Hujala, T., Karppinen, H., Didot, F., Mizaraité, D., 2017. Gender in European forest ownership and management: reflections on women as “New forest owners”. *Scand. J. For. Res.* 32 (2), 174–184.
- Forskning.no, 2022. Er skogbruket den største trusselen mot arts mangfold i Norge? Available at: <https://forskning.no/naturvern-skog-skogbruk/er-skogbruket-den-storste-trusselen-mot-arts-mangfold-i-norge/2077493>.

- Framstad, E., Kolstad, A.L., Nybø, S., Tøpper, J., Vandvik, V., 2022. The condition of forest and mountain ecosystems in Norway. In: Assessment by the IBECA Method, 8242648883. <https://hdl.handle.net/11250/2980092>.
- Gangdal, J., 2011. Drømmen om Marka. 100 års kamp for friluftsliv. H. Aschehough & Co. (W. Nygaard), Oslo.
- Gómez-Baggethun, E., Martín-López, B., 2015. Ecological economics perspectives on ecosystem services valuation. In: Handbook of Ecological Economics. Edward Elgar Publishing, pp. 260–282.
- Gómez-Baggethun, E., Martín-López, B., Barton, D., Braat, L., Kelemen, E., García-Llorente, M., Saarikoski, H., van den Bergh, J., Arias, P., Berry, P., 2014. State-of-the-art report on integrated valuation of ecosystem services. In: EU FP7 OpenNESS Project Deliverable, Vol. 4, pp. 1–33.
- Gómez-Baggethun, E., Barton, D.N., Berry, P., Dunford, R., Harrison, P.A., 2016. Concepts and methods in ecosystem services valuation. In: Routledge Handbook of Ecosystem Services, pp. 99–111.
- Helseth, E.V., Vedeld, P., Framstad, E., Gómez-Baggethun, E., 2022. Forest ecosystem services in Norway: trends, condition, and drivers of change (1950–2020). *Ecosyst. Serv.* 58, 101491 <https://doi.org/10.1016/j.ecoser.2022.101491>.
- Hoen, H.F., Svendsrud, A., Bækkelund, B., 2019. Skogbruk i Norge. Great Norwegian Encyclopedia.
- IPBES, 2022a. Methodological assessment report on the diverse values and valuation of nature of the intergovernmental science-policy platform on biodiversity and ecosystem services. In: Balvanera, P., Pascual, U., Christie, M., Baptiste, B., González-Jiménez, D. (Eds.), IPBES secretariat. Bonn, Germany.
- IPBES, 2022b. Summary for Policymakers of the Methodological Assessment Regarding the Diverse Conceptualization of Multiple Values of Nature and its Benefits, Including Biodiversity and Ecosystem Functions and Services (Assessment of the Diverse Values and Valuation of Nature). Plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Ninth session, Bonn, Germany.
- Jacobs, S., Denoncker, N., Martín-López, B., Barton, D.N., Gomez-Baggethun, E., Boeraeve, F., McGrath, F.L., Vierikko, K., Geneletti, D., Sevecke, K.J., 2016. A new valuation school: integrating diverse values of nature in resource and land use decisions. *Ecosyst. Serv.* 22, 213–220. <https://doi.org/10.1016/j.ecoser.2016.11.007>.
- Jakobsson, S., Pedersen, B., 2020. Naturindeks for Norge 2020 (Tilstand og utvikling for biologisk mangfold).
- Jenkins, M., Schaap, B., 2018. Forest Ecosystem Services. United Nations Forum on Forests.
- Kaldal, I., 2022. Skogens menn - minner og myter om hoggere og fløtere.
- Kangas, A., Saarinen, N., Saarikoski, H., Leskinen, L.A., Hujala, T., Tikkanen, J., 2010. Stakeholder perspectives about proper participation for regional Forest Programmes in Finland. *Forest Policy Econ.* 12 (3), 213–222. <https://doi.org/10.1016/j.forpol.2009.10.006>.
- Langemeyer, J., Palomo, I., Baraibar, S., Gómez-Baggethun, E., 2018. Participatory multi-criteria decision aid: operationalizing an integrated assessment of ecosystem services. *Ecosyst. Serv.* 30, 49–60. <https://doi.org/10.1016/j.ecoser.2018.01.012>.
- Lindahl, K.B., Sandström, C., Sténs, A., 2017a. Alternative pathways to sustainability? Comparing forest governance models. *Forest Policy Econ.* 77, 69–78. <https://doi.org/10.1016/j.forpol.2016.10.008>.
- Lindahl, K.B., Sténs, A., Sandström, C., Johansson, J., Lidskog, R., Ranius, T., Roberge, J.-M., 2017b. The Swedish forestry model: more of everything? *Forest Policy Econ.* 77, 44–55. <https://doi.org/10.1016/j.forpol.2015.10.012>.
- Lindhjem, H., Magnussen, K., 2012. Verdier av økosystemtjenester i skog i Norge. NINA Report. <http://hdl.handle.net/11250/2643062>.
- Liu, X., Vedlitz, A., Shi, L., 2014. Examining the determinants of public environmental concern: evidence from national public surveys. *Environ. Sci. Pol.* 39, 77–94.
- Lovdata, 2004. Forskrift om tilskudd til skogbruksplanlegging med miljøregistreringer. Available at: <https://lovdata.no/dokument/SF/forskrift/2004-02-04-449> (accessed: 29.01.23).
- Lovdata, 2006. Lov om skogbruk (skogbrukslova). Available at: <https://lovdata.no/dokument/NL/lov/2005-05-27-31> (accessed: 29.05.23).
- Lovdata, 2008. Lov om planlegging og byggesaksbehandling (plan- og bygningsloven). Available at: <https://lovdata.no/dokument/NL/lov/2008-06-27-71> (accessed: 12.12.22).
- Lovdata, 2009. The Biodiversity Act. Available at: <https://lovdata.no/dokument/NL/lov/2009-06-19-100>.
- Lovdata, 2017. Forskrift om konsekvensutredning. Available at: https://lovdata.no/dokument/SF/forskrift/2017-06-21-854#KAPITTEL_1.
- Martin, A., O'Farrell, P., Eser, U., Faith, D.P., Gomez-Baggethun, E., Quaas, M., et al., 2022. Chapter 5: The role of diverse values of nature in visioning and transforming towards just and sustainable futures. In: In Christie, M., Balvanera, P., Pascual, U., Baptiste, B., González-Jiménez, D. (Eds.), Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES secretariat, Bonn, Germany.
- Martinez-Alier, J., 2003. The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation. Edward Elgar Publishing.
- Martinez-Alier, J., Munda, G., O'Neill, J., 1998. Weak comparability of values as a foundation for ecological economics. *Ecol. Econ.* 26 (3), 277–286. [https://doi.org/10.1016/S0921-8009\(97\)00120-1](https://doi.org/10.1016/S0921-8009(97)00120-1).
- Millennium Ecosystem Assessment [MEA], 2005. Ecosystems and Human Well-Being: Synthesis. Island Press, Washington, DC.
- Ministry of Climate and Environment [MCE], 2016. Meld. St. 18 (2015–2016). Friluftsliv — Natur som kilde til helse og livskvalitet.
- Ministry of Climate and Environment [MCE], 2018. Handlingsplan for friluftsliv. Natur som kilde til helse og livskvalitet.
- Nesbakken, S., 2022. Skogøkosystemer og helse: Livskvalitet knyttet til skog, flatehogst og naturtap: Universitetet i Sørst-Norge.
- Norges skogeierforbund, 2023. Skogbruksplan accessed: 29.01.23.
- Norwegian Environment Agency [NEA], 2014. Kartlegging og verdsetting av friluftslivsområde - veileder. M98–2013.
- Norwegian Environment Agency [NEA], 2020. Deltakelse i friluftsliv. Available at: <https://miljostatus.miljodirektoratet.no/tema/friluftsliv/deltakelse-i-friluftsliv/>. accessed: 07.07.20.
- NOU 1998:16, 1998. Nytt-kostnadsanalyser. Veiledning i bruk av lønnsomhetsvurderinger i offentlig sektor.
- O'Neill, J., Spash, C.L., 2000. Conceptions of value in environmental decision-making. *Environ. Values* 9 (4), 521–536.
- O'Neill, J., Holland, A., Light, A., 2008. Environmental Values. Routledge.
- Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E., Stenese, M., Watson, R.T., Dessane, E.B., Islar, M., Kelemen, E., 2017. Valuing nature's contributions to people: the IPBES approach. *Curr. Opin. Environ. Sustain.* 26, 7–16. <https://doi.org/10.1016/j.cosust.2016.12.006>.
- Primmer, E., Varumo, L., Krause, T., Orsi, F., Geneletti, D., Brogaard, S., Aukes, E., Ciolli, M., Grossmann, C., Hernández-Morcillo, M., 2021. Mapping Europe's institutional landscape for forest ecosystem service provision, innovations and governance. *Ecosyst. Serv.* 47, 101225.
- Saarikoski, H., Mustajoki, J., Barton, D.N., Geneletti, D., Langemeyer, J., Gomez-Baggethun, E., Marttunen, M., Antunes, P., Keune, H., Santos, R., 2016. Multi-criteria decision analysis and cost-benefit analysis: comparing alternative frameworks for integrated valuation of ecosystem services. *Ecosyst. Serv.* 22, 238–249. <https://doi.org/10.1016/j.ecoser.2016.10.014>.
- Sagoff, M., 1998. Aggregation and deliberation in valuing environmental public goods: a look beyond contingent pricing. *Ecol. Econ.* 24 (2–3), 213–230. [https://doi.org/10.1016/S0921-8009\(97\)00144-4](https://doi.org/10.1016/S0921-8009(97)00144-4).
- Sandström, C., Kanyama, A.C., Rätty, R., Sonnek, K.M., Nordström, E.-M., Mossing, A., Nordin, A., 2020. Policy goals and instruments for achieving a desirable future forest: experiences from backcasting with stakeholders in Sweden. *Forest Policy Econ.* 111 <https://doi.org/10.1016/j.forpol.2019.102051>.
- Sheppard, S.R., Meitner, M., 2005. Using multi-criteria analysis and visualisation for sustainable forest management planning with stakeholder groups. *For. Ecol. Manag.* 207 (1–2), 171–187. <https://doi.org/10.1016/j.foreco.2004.10.032>.
- Sirnes, E.S., Gerhard, Nilsen, Heidi, 2021. nytte-kostnadsanalyse i Store norske leksikon på snl.no. Available at: <http://snl.no/nytte-kostnadsanalyse>.
- Skavhaug, I.M., Godal, R., Vangsnes, R.W., 2022. Bærekraft i distriktskommuner: Hvordan innbygere i distriktskommuner forstår bærekraft, og hvordan distriktskommuner arbeider med bærekraftig samfunnsutvikling.
- Skogen, K., 2018. Privat eiendomsrett er elefant i rommet. In: Samtiden. Tidsskrift for politikk, litteratur og samfunnsforskning, Nr. 1 2018.
- Statistics Norway [SSB], 2015. Nye tider for skogeigaren. Available at: <https://www.ssb.no/jord-skog-jakt-og-fiskeri/artikler-og-publikasjoner/nye-tider-for-skogeigaren>. accessed: 03.02.22.
- Statistics Norway [SSB], 2021a. Levekårsundersøkelsen. Available at: <https://www.ssb.no/kultur-og-fritid/idrett-og-friluftsliv/statistikk/idrett-og-friluftsliv-levekarsundersokelsen>. accessed: 05.02.2023.
- Statistics Norway [SSB], 2021b. This is Norway. Available at: <https://www.ssb.no/en/befolkning/folketal/artikler/this-is-norway-2021>.
- Statistics Norway [SSB], 2023a. Kommune fakta. Available at: <https://www.ssb.no/kommunefakta>. accessed: 03.02.2023.
- Statistics Norway [SSB], 2023b. Skogavvikling for salg. Available at: <https://www.ssb.no/statbank/table/03795/>. accessed: 28.05.23.
- Statkog, 2015. Hvem eier skogen? <https://www.statkog.no/skog-og-klima/hvem-eier-skogen>. accessed: 05.05.2020.
- TEEB, 2010. The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A Synthesis of the Approach. Conclusions and Recommendations of TEEB.
- Tomter, S.M., 2023. Sertifisering av skog i Store norske leksikon på snl.no. Available at: http://snl.no/sertifisering_av_skog.
- Tomter, S.M., Dalen, L.S., 2018. Bærekraftig skogbruk i Norge. In: Norsk institutt for bioøkonomi. Available at: <https://www.skogbruk.nibio.no/> (accessed: 10.01.22).
- Vatn, A., 2005. Institutions and the Environment. Edward Elgar Publishing, Cheltenham.
- Vatn, A., 2015. Environmental Governance: Institutions, Policies and Actions. Edward Elgar Publishing.
- Vatn, A., 2021. Bærekraftig økonomi. Innsikt fra økologisk og institusjonell økonomi. Oslo. Fagbokforlaget.