Forest Policy and Economics 166 (2024) 103270

Contents lists available at ScienceDirect

Forest Policy and Economics

journal homepage: www.elsevier.com/locate/forpol

Implementing the EU LULUCF regulation in Norway: Short-term and long-term policy coherence challenges

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ARTICLE INFO

Keywords:
Climate policy
EU
Forestry
Land use
Norway
Policy coherence

ABSTRACT

Forests play a significant role in Norway's Land Use, Land-Use Change, and Forestry (LULUCF) sector, where the forest sink is equal to about 40% of the national emissions from all other sectors combined. Although not an EU member, Norway has adopted the EU LULUCF regulation through a climate agreement with the EU. This article examines how the LULUCF regulation influences the coherence of Norway's forest policies. Adopting the regulation initially received little public debate, but there is increasing political contestation over how to achieve the LULUCF net carbon dioxide removal target. In the short term, reaching the target might imply rapidly reducing forest harvest, but this would decrease activity in the forestry sector and the supply of harvested wood products that could involve substituting less climate-friendly materials and energy sources. From a long-term perspective, forest management efforts like denser planting, fertilization, harvesting, and rejuvenation might be needed to increase the forest sink capacity. Such policies are supported by forest owners and forestry organizations, but they are opposed by some environmental NGOs and other stakeholders advocating for the protection of forests and biological diversity. The study concludes that assessments of coherence crucially depend on how problems are defined and the time perspective adopted.

1. Introduction

Policy coherence has become an important objective in climate and environmental governance and other policy areas. The literature has tended to assume that policy coherence and integration can be achieved by promoting synergies and reducing conflicts across policy domains (e.g., Nilsson et al., 2012; Skjærseth et al., 2016; Dupont, 2016). The European Union (EU) has attempted to design coherent policies by creating policy packages, such as the 2009 Climate and Energy Package, the 2019 European Green Deal, and the 2023 Fit for 55 climate policy framework. However, in climate and environmental governance, policymakers are increasingly confronted with trade-offs and conflicting objectives rather than synergies. Such trade-offs and conflicts are particularly apparent in the forestry sector, which is expected to deliver on potentially conflicting policy objectives, including carbon sequestration, biodiversity conservation, and increased supply of biomass and wood products that can replace fossil-fuel-intensive building materials such as steel and cement. Hence the forestry sector arguably represents one of the governance domains with the most demanding climate and environmental policy coherence challenges.

This study uses forest sink policies in Norway—a forest-rich country with ambitious climate and environmental policy objectives—as a case study to examine such challenges in an international context. The capacity of forests to remove CO_2 from the atmosphere is considered vital in climate mitigation efforts. Forests play a major role in the Land Use, Land-Use Change, and Forestry (LULUCF) sector, particularly in Norway, where, in 2021, the forest sink was equal to approximately 40% of the national emissions from all other sectors (Norwegian Environment Agency, 2023). Forests are also critical as biodiversity hotspots, home to 60% of Norway's 44,000 mapped species, including about half of the threatened and vulnerable species on the 2021 Norwegian Red List.[1] Forests comprise approximately 12.7 million hectares (127,000 km^2), or 39% of Norway's land area. Of this, approximately 8.6 million hectares are productive forest areas. Hence, Norwegian forests are essential for timber harvesting, biodiversity preservation, and carbon sequestration.

The point of departure for this study is Norway's climate policy collaboration with the EU, which has become ever closer and more comprehensive (Gulbrandsen and Hermansen, 2022). Being an

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[1] https://miljostatus.miljodirektoratet.no/miljomal/naturmangfold/miljomal-1.2/miljoindikator-1.2.4

https://doi.org/10.1016/j.forpol.2024.103270
Received 29 February 2024; Received in revised form 9 May 2024; Accepted 3 June 2024
Available online 14 June 2024

associated non-member state, Norway entered into a climate agreement with the EU, incorporated into the European Economic Area (EEA) agreement in 2019. The climate agreement meant that Norway is a participant in the EU's climate policy framework from 2021 to 2030, including the LULUCF regulation. Whereas forest management has traditionally been the competence of EU member states, the Fit for 55 climate policy framework represents a new development. The LULUCF regulation in the framework may have significant implications for forest management in member and associated states. With this backdrop, the following research question is examined: *How does the EU LULUCF regulation influence the coherence of Norwegian forest policies in a short-term and long-term perspective?*

The decision to adopt the LULUCF regulation initially received little public debate or attention, but there is increasing contestation over how to achieve the LULUCF target (Farstad et al., 2021). There are several trade-offs, conflicts, and sector interests involved in designing and implementing forest sink policies. Whereas the primary objective of forest protection is to protect biodiversity and representative types of forests, the objective of forest sink policies is to increase the net removal of carbon dioxide (CO_2). Depending on policy choices and design, policies to achieve these objectives could be synergistic or conflicting. Other conflicting objectives may exist for forest protection and the supply of biomass and other forest materials to substitute for fossil fuels (IPBES-IPCC, 2021). These conflicts are further exacerbated by a complex web of laws and regulations, complicating coherence between different objectives, including climate mitigation and adaptation, biodiversity protection, increased use of harvested wood products, and economic development. There may also be trade-offs involved in increasing the forest sink from a short-term and long-term perspective, given that trees grow slowly in a cold climate and most of the management efforts to increase forest sink capacity have little short-term impact (Søgaard et al., 2020). These policy coherence challenges are examined in this study.

2. Analytical approach and method

There is a substantial literature on policy integration and related concepts such as policy coordination and policy interaction (see Jordan and Lenschow, 2010; Tosun and Lang, 2017; Peters, 2018). The literature on policy integration examines the integration of one specific policy into other policy areas, as seen, for example, in studies of environmental policy integration (e.g. Lenschow, 2002; Jordan and Lenschow, 2010) and climate policy integration (e.g. Dupont, 2016). By contrast, studies of policy coherence more often handle the different policies examined on an *equal footing* (Lenschow et al., 2018: 323). In this view, coherence is a policy attribute that refers to the achievement of *common* objectives within and across policies (den Hertog and Stross, 2013: 4).

Initial studies on policy coherence can be traced to the efforts of a range of international organizations, including the Organization for Economic Cooperation and Development (OECD), the World Bank, the World Health Organization (WHO) and various UN other agencies, to develop strategies, indicators, plans, and reforms to improve coherence within and across policies (Lenschow et al., 2018: 323). Similarly, the EU has developed a growing number of strategies, plans, and "road maps" to enhance synergies and mutually reinforcing policies (ibid). The need for designing and implementing coherent policies to address the complex and intertwined problems of climate change, land-use change, and biodiversity loss is also being recognized by the scientific community (e.g., IPCC, 2019; IPBES-IPCC, 2021). With an increasing number of reports and policy studies on coherence, we have also witnessed growing academic interest in studying and understanding coherence within and across policy spheres.

According to Nilsson et al. (2012: 396), policy coherence can be defined as "an attribute of policy that systematically reduces conflicts and promotes synergies between and within policy areas to achieve the outcomes associated with jointly agreed policy objectives". As indicated above, den Hertog and Stross (2013) offer a similar definition. However, in the context of climate change mitigation, biodiversity loss and land use, we are not necessarily dealing with "jointly agreed policy objectives" but potentially *conflicting* policy objectives. Following Lenschow et al. (2018: 323), we thus view policy coherence as a continuum; a minimal level of coherence implies policies that do not directly contradict each other, whereas a high level of coherence is achieved when policies are mutually reinforcing. Policy *incoherence* exists when policies directly contradict each other. In such a situation, trade-offs and suboptimal outcomes can be expected. For example, forest management efforts like denser planting, fertilization, harvesting, rejuvenation, and change in tree species might be needed to increase the forest sink capacity, but such policies could be harmful to old-growth forests and other key habitats.

In assessing coherence, we do not assume a priori that the objectives of one policy should be prioritized over another (Lenschow et al., 2018: 323). This is an important point, given that implementing climate, biodiversity, and forest policy objectives often involves considering conflicting objectives concerning land use and forestry. Notably, the policy coherence literature has thus far not paid sufficient attention to the trade-offs and conflicts involved in designing and implementing coherent policies within and across sectors (Bocquillon, 2018; Righettini and Lizzi, 2021: 107).

The point of departure for investigating the research question is the coherence between the EU LULUCF regulation and forest policies in Norway. This investigation contributes to the study of *vertical coherence* across levels of governance, especially between EU policies and the policies of member and associated states (Lenschow et al., 2018). The case study also contributes to the study of *horizontal policy coherence* between two or more policy areas at the same level of governance (Lenschow et al., 2018). Whereas forest protection policy has a long legacy in Norway, forest sink policy is at the heart of LULUCF. These two policies may, depending on policy choices and design, be conflicting or synergistic.

Following Nilsson et al. (2012), policy coherence is examined at three analytical levels: policy objectives, policy instruments, and implementation. The point of departure for examining policy coherence at each analytical level is as follows:

- *Policy objectives*: The extent to which policy objectives within or between policy areas are conflicting or mutually reinforcing.
- *Policy instruments*: the extent to which policy instruments within or between policy areas are conflicting or mutually reinforcing.
- *Implementation*: the extent to which the implementation of a policy conflicts with or reinforces the implementation of other policies in the same or other policy areas.

To these analytical levels, this study adds *temporal coherence* as a dimension to be examined within and across policies. The time inconsistency problem, as described by Kydland and Prescott (1977) in their Nobel-prize winning work, is arguably a neglected problem in much of the policy coherence literature. Time inconsistency problems may arise because optimal choices at one point in time may conflict with optimal choices in the future (Hovi et al., 2009: 21). Such problems are likely to arise when governments are faced with long-term policy challenges, such as climate change. Similarly, the forest sector is characterized by long time frames, not least in the boreal regions where forest growth is slow. Time inconsistency problems in the forestry sector may arise when a forest policy that is optimal to increase carbon sinks toward 2030 is suboptimal toward 2050 and beyond.

This study uses policy analysis (Fischer, 1995) to examine policy development and coherence within and across the areas of forest sinks and forest protection. This study examines both policy outputs and stakeholder positions on appropriate policies. Written sources examined to assess the coherence of policy outputs, as expressed in the EU LULUCF regulation and Norwegian public policies, include various policy

documents, reports, and assessments concerning forest protection and forest sinks. The period examined is 2018–2024, but some earlier policy developments are also scrutinized.

Coherence can be seen as a matter of formal policy objectives and instruments (Nilsson et al., 2012) or as a political process involving problem definitions (Kurze and Lenschow, 2018) and narratives of coherence by policy entrepreneurs (Bocquillon, 2018). Whereas the former conceptualization is most evident in studies of the outputs of the policy formulation process, the latter can most often be seen in studies of discourses and ideas (Fopa Tchinda and Talbot, 2024: 87).

Examining not only policy documents but also stakeholder positions is important, because any assessment of coherence ultimately depends on the beholder's perspective and criteria (Bocquillon, 2018: 341). In this study, all public hearing responses to the EU's proposal for a revised LULUCF regulation (2021) have been systematically examined to supplement the policy output analysis. The aim was to identify and categorize stakeholder positions concerning forest sink policies and preferred policy instruments, as well as emerging policy coalitions. This investigation was possible because it is standard procedure in Norway to invite all stakeholders to comment on new legislative proposals and policies in a public hearing process. In 2021, the government asked all relevant stakeholders to comment on three legislative proposals in the Fit for 55 climate policy framework: the EU emissions trading system (EU ETS), the Effort Sharing Regulation (ESR), and the LULUCF regulation. The government received 37 hearing responses from various stakeholders. They are all examined in this study.[2]

3. EU obligations and stakeholder responses

3.1. The EU LULUCF regulation

The EU LULUCF regulation is a landmark piece of legislation for a sector only partially regulated under the Kyoto Protocol (Romppanen, 2020; Savaresi et al., 2020). As such, it is the first comprehensive set of rules for emissions from forestry, land use, and land-use change at the international level (Savaresi et al., 2020). Before adopting the Paris Agreement, the EU decided to include the LULUCF sector in its climate policy framework in order to achieve the economy-wide emissions reduction target for 2021–2030. In its 2015 Intended NDC for the Paris Agreement, the EU announced it would establish specific rules for the LULUCF sector. The EU had ruled out the option of including the LULUCF sector in the EU ETS. Accordingly, the two options considered were to include LULUCF in the Effort Sharing Regulation (ESR) scope or to develop a separate pillar in the EU climate policy framework. In the end, the latter approach was taken, but the LULUCF pillar was connected to the ESR pillar through flexibility mechanisms, which means mainly that some credits or debits from the two pillars can be exchanged (Romppanen, 2020). The binding target for the LULUCF sector was the so-called "no-debit rule", according to which each EU member state shall ensure that accounted emissions from land use are compensated by at least an equivalent amount of accounted removals in the period 2021–2030.

The EU adopted the LULUCF Regulation (Regulation (EU) 2018/841) in May 2018. The next year, this regulation was extended to Iceland and Norway by incorporation into the European Economic Area (EEA) Agreement.[3] The 2018 LULUCF regulation requires EU member states to account for greenhouse gas (GHG) emissions and removals from managed forest land; land subject to deforestation, afforestation, or reforestation activities in the past 20 years; and cropland and managed grassland.

In December 2019, the European Commission presented an ambitious plan for green growth. The cross-sectoral plan, called the European Green Deal, aims to solve climate and environmental challenges across policy areas. An overriding goal for the European Green Deal is to achieve net zero emissions of greenhouse gases by 2050 and, at the same time, to facilitate green growth and fairness in the climate and energy transition. In its report on the European Green Deal, the Commission announced that as a milestone on the road to 2050, they would present a strengthened policy package to increase the EU's climate target from 40 to at least 50 and up to 55% cuts by 2030 compared to 1990. About a year later, in December 2020, the EU strengthened its emissions target to at least a 55% cut from 1990 to 2030.

The strengthened goal meant that the EU's climate policy package for 2030, which was adopted in 2019, had to be revised and tightened. The European Commission presented the new package of legislative proposals in July 2021. The package is called "Fit for 55" because it aims to ensure that the EU achieves its goal of reducing greenhouse gas emissions by at least 55% by 2030. The package of legislative proposals contains more ambitious plans and measures in all three pillars and in several other regulations.

In July 2021, the European Commission proposed a revised and more demanding LULUCF regulation. The Parliament and the Council supported the revised regulation, which was adopted in April 2023 for the period up to 2030. The revised LULUCF regulation has a separate land-based net carbon removal target of 310 million tons of CO_2e by 2030. The revised regulation consists of two phases. In the first phase, from 2021 to 2025, the regulation does not affect the current "no-debit rule". In the second phase, from 2026 to 2030, the EU-wide target of 310 million tons CO_2e net removal by 2030 applies, representing an increase of about 15% in the EU's net removals compared to current levels. This phase also enlarges the terrestrial scope of the regulation to include wetland management activities and, in effect, all managed land. In terms of accounting, an essential change in this phase is abandoning the accounting categories and the Forest Reference Levels from the first phase and getting closer to an approach that is similar to the accounting rules under the UNFCCC. Consequently, Norway must renew its climate agreement with the EU following the adoption of a more ambitious target in the Fit for 55 package of legislation (2023), including the upgraded LULUCF regulation.

By contrast, as a non-EU member, Norway is not a participant in the EU's nature protection and forest policies. However, several international legal obligations and political commitments affect forest protection policies. The most important multilateral agreement at the global level is the UN Convention on Biological Diversity (CBD, 1992). Moreover, domestic policies to enhance forest protection have a long history compared to policies designed to increase carbon sequestration in forests. Table 1 summarizes how international and EU obligations influence Norwegian policies for forest sinks and forest protection.

3.2. Stakeholder responses to the revised EU LULUCF regulation

Examining stakeholder responses to the Fit for 55 proposals in Norway (2021) shows that just over one-third (13 out of 37) of the stakeholders commented explicitly on the proposal for a revised LULUCF regulation. Whereas seven hearing statements expressed support for improved forest management to increase forest sinks, only two statements argued for reduced harvesting and forest protection to increase sinks. In this context, improved forest management implies increasing the supply of harvested wood products and the sink capacity over the long term through measures such as denser planting, fertilization,

[2] All responses are publicly available from the government's webpages: https://www.regjeringen.no/no/dokumenter/offentlig-horing-av-kommisjonens-forslag-til-tre-forsterkede-regelverk-ets-innsatsfordelingsforordningen-og-skog-og-arealbruksregelverket/id2867120/?showSvar=true&term=&page=1&isFilterOpen=true

[3] Joint Committee Decision No 269/2019, which entered into force on 11 March 2020.

Table 1
Influence of international and EU obligations on Norwegian policies for forest sinks and forest protection.

		International agreements	
EU regulations	Included in the EEA agreement: Climate policies	UN Framework Convention on Climate Change, Kyoto Protocol, Paris Agreement **Forest sink policy**	Convention on Biological Diversity, multilateral nature protection agreements, international forest agreements
	Excluded from the EEA agreement: Biodiversity and forest policies		**Forest protection policy**

harvesting, rejuvenation, and a change in tree species from low-productive to high-productive forests. Only two environmental non-governmental organizations (NGOs) from Norway's large community of environmental NGOs—Sabima and WWF—commented on the proposals. They argued for reduced harvesting and increased forest protection to achieve the proposed net removal target. This relatively low NGO response rate could be due to a limited capacity to comment on the highly technical and complex nature of the LULUCF regulation. Table 2 summarizes the responses to the LULULCF regulation in the public hearing.

The general pattern of responses shows that the environmental NGOs supported the upgraded LULUCF target or even a more ambitious net removal target (Sabima, 2021; WWF, 2021). By contrast, stakeholders from the forestry sector, including the Norwegian Forest Owners' Federation (2021) and NORSKOG (2021), opposed the LULUCF target. They agreed with the NGOs that reaching the 2030 target might imply less harvesting but maintained that forest management efforts like harvesting and rejuvenation, denser planting, and fertilization were needed to increase the forest sink capacity in a long-term perspective. There was also concern among the forest sector stakeholders that reduced harvesting to increase forest sinks could increase the risk of emitting large amounts of carbon because of storms, forest fires, bark beetle attacks, drought summers, and other factors not under human control. The Norwegian Environment Agency (2021) did not express support for either improved forest management or forest protection in the hearing statement but in other policy documents the Agency has agreed with the forest sector interests that improved forest management is needed to increase net carbon removals from forests in the long term (Norwegian Environment Agency, 2020).

Another concern expressed by several forest sector and industry stakeholders was that measures that may have an effect in the short term—reduced harvesting in particular—will diminish the supply of harvested wood products (HWP) for replacing fossil fuels and less climate-friendly industrial products. HWP contribute to climate mitigation through (1) carbon storage in harvested wood and (2) substituting for other materials and energy sources such as fossil fuels. For example, wood products can substitute for fossil-fuel-intensive building materials such as steel and cement in the building sector. The carbon content of HWP moves through different levels through their life cycle and is finally released into the atmosphere. Reduced supply of wood and forest biomass (e.g., wood waste) could represent a severe challenge to the building sector's climate mitigation efforts and biofuel and biomass suppliers. Such concerns were expressed by the forest owner organizations (Norwegian Forest Owners' Federation, 2021; NORSKOG, 2021), the Confederation of Norwegian Enterprise (2021), and energy companies (Biogas Norway, 2021; St1 Norway, 2021).

4. Implications for forest sink policies in Norway

This section examines the implications of the EU LULUCF regulation for Norway. Within the LULUCF sector, the target in Norway's 2019 climate agreement with the EU is that emissions should not exceed removals in the period 2021–2030 (the "no-debit rule" in the 2018 LULUCF regulation). In the upgraded LULUCF regulation (2023), this target has been replaced by a net removal target for 2026–2030. The targets for both periods will be challenging for Norway to reach. Although there are considerable net GHG removals from Norwegian forests each year, net removals in the first commitment period (2021-2025) are compared to a *Forest Reference Level (FRL)*. The FRL is a projected country-level benchmark of net emissions or removals against which the future net emissions or removals will be compared. Based on a historical reference period, the FRL forecasts the expected development of the forest carbon sink if the historical management practices were continued, factoring in forest age dynamics. Therefore, the extent to which Norway can maintain or increase net removals compared to a benchmark (the FRL) is the key to measuring target achievement. In the second commitment period, from 2026 to 2030, the EU is, as mentioned previously, abandoning the accounting categories and the FRL from the first period. For this period, average net removals from 2016 to 2018 will be used as the benchmark for measuring target achievement.[4]

The FRL and the accounting categories in the LULUCF regulation are particularly unfavorable to Norway for the period 2021–2025. For that period, emissions and removals are compared with projections (FRL) based on historical net removals from 2000 to 2009 (the reference period). In the reference period, net removals from Norwegian forests reached a historical peak. Fig. 1 shows that the annual net removals from forests increased until 2009 to over 35 million tonnes of CO2 equivalents (Mohr et al., 2022). This increase was mainly due to past forest management and forest planting in the 1950s and 1960s (Søgaard et al., 2020). Since 2009, net removals have been declining due to the increasing proportion of forests reaching the most mature development class, ripe for final harvest. In 2021, the last reported year, there was a net removal of around 20 million tonnes of CO_2 equivalents (Norwegian Environment Agency, 2023). The projections show a continued decline in net removals before the rate stabilizes around 2050; see Fig. 1 (Mohr et al., 2022). A gap will arise between the projected FRL and net removals in the first commitment period (2021-2025), which must be filled with measures to increase net removals (such as reduced harvesting) or by using flexible mechanisms available in the LULUCF regulation.[5]

Under the LULUCF regulation, carbon emissions and removals from HWP are accounted for, but only for paper, wood panels, and sawn wood. When timber and pulpwood are exported, they are not included as HWP in Norway's GHG inventory reports and do not count toward the LULUCF target. While the share of annual harvest reported as HWP in the Norwegian GHG inventory reports in the 1990s was around 80%, the level in recent years has been about half of that (Alfredsen et al., 2018). Closure of paper mills and a decline in the production of paper and cardboard products in Norway has had a major impact on the Norwegian GHG inventory (Mohr et al., 2022; Ross et al., 2023). These developments have moved timber, and especially pulpwood processing, abroad. Pulpwood that was previously processed into paper products in Norway is now exported to Sweden primarily, followed by Germany, Latvia, and Denmark.

Since 2017, Norway has reported annual net carbon storage in HWP (Ross et al., 2023). Projections indicate that although HWP has the

[4] Regulation (EU) 2023/839, article 4.
[5] Regulation (EU) 2023/839, article 12 and article 13.

Table 2
Responses to the proposed LULUCF regulation in the public hearing (September 2021).

Organization	Critical of LULUCF	Neutral about LULUCF	Supportive of LULUCF	Forest management	Forest protection
Biogas Norway (energy company)		✓		✓	
Norwegian Association of Local and Regional Authorities (KS)		✓			
Directorate of Agriculture		✓		✓	
Norwegian Environment Agency			✓		
No to the EU Movement in Norway	✓				
Norwegian Farmers' Association		✓		✓	
Norwegian Forest Owners' Federation	✓			✓	
NORSKOG (forest owner organization)	✓			✓	
Confederation of Norwegian Enterprise (NHO)	✓			✓	
Sabima (environmental NGO)			✓		✓
St1 Norway (energy company)		✓		✓	
Vestfold and Telemark regional county		✓			
WWF Norway			✓		✓

potential to significantly contribute to the LULUCF commitment by 2030, there are several barriers to realizing this potential in practice. These include the costs and operational challenges of restructuring the current Norwegian forest industry, which has become ever more geared toward exports of timber and pulpwood that do not count toward the LULUCF target (Ross et al., 2023).

There is increasing political contestation over how to implement the LULUCF regulation. In June 2023, it became publicly known that the Parliamentary group of the Center Party, which has been in a coalition government with the Labor Party since 2021, wanted Norway to withdraw from the regulation and possibly suspend the climate agreement with the EU.[6] It appears that the two coalition partners have instead agreed to use flexible mechanisms to help fulfil Norway's obligations. This strategy is possible because the Fit for 55 framework allows emission units and forest credits acquired from other countries to be used to meet obligations under the LULUCF regulation. For the first LULUCF period (2021–2025), Norway faces a deficit of around 34 million tons of CO_2 equivalents (Mohr et al., 2022). The deficit can be reduced to around 16 million tons of CO_2 if Norway uses a compensation mechanism in the LULUCF regulation (Ministry of Climate and Environment, 2023).[7] In November 2023, the government asked the Parliament to authorize the Ministry of Climate and Environment to enter into agreements and letters of intent with the EU for the purchase of emission units and forest credits within a total framework of up to NOK 3 billion (about €260 million) (Ministry of Climate and Environment, 2023). However, these flexible mechanisms will not fully forestall the need for additional measures to increase net removals from forests by 2030.

5. The coherence of forest sink and forest protection policies

This section compares Norway's policy to implement the EU LULUCF regulation with the existing forest protection policy in terms of the analytical levels identified in section 2: policy objectives, policy instruments, and implementation, with particular attention to the temporal dimension across all levels. Each subsection begins with a brief account of the existing protection policy followed by an examination of new policies to increase carbon removals. Table 3 summarizes policy objectives, instruments, and implementation, as well as possible trade-offs across the policies and in the short- and long-term.

5.1. Policy objectives

Since 1981, the objective of Norway's forest protection policy has been to protect representative types of forests over the long term (Ministry of the Environment, 1981). Forest protection is of critical imporance for biological diversity given that forests are home to about 60% of Norway's known species, as well as nearly half of the threatened and vulnerable speices on the Norwegian Red List.[8] In 2016, the Storting (Parliament) adopted a political target to protect at least 10% of the forestland in Norway (no target year).

The objective of Norway's forest sink policy is to implement the EU LULUCF regulation (Stortinget, 2019) and the Paris Agreement. Provided an updated climate agreement with the EU is concluded and ratified, the LULUCF regulation requires Norway to adhere to the "no-debit rule" from 2021 to 2025 and a "net removal target" from 2026 to 2030. Whether the LULUCF targets are synergistic or in conflict with Norway's forest protection objective depends upon the policy instruments chosen and the implementation of the policy, as well as the time perspective adopted. These issues are examined in the following two sections.

5.2. Policy instruments

To achieve the forest protection objective, designated forest areas are legally protected as nature reserves under Norway's 2009 Nature Diversity Act. Nature reserves are generally the most strictly protected areas in Norway, which means that management approaches focus on long-term environmental protection objectives (Fauchald, 2016). Some forests are also protected in national parks and other types of protected areas.

By contrast, the preferred policy instruments for increasing the forest sink are subsidies and regulations under the 2005 Forestry Act with the aim of improving forest management. Measures include extended rotation age/cutting cycle, denser planting and fertilization, and possibly a change in tree species from low-productive to high-productive forests. The government has considered a policy of the large-scale planting of Norway spruce in areas where spruce is expected to grow better than the naturally occurring species (Norwegian Environment Agency, 2019). Those areas are mainly lands in various states of natural transition to a forest dominated by deciduous broadleaved tree species. However, coniferous forestation has not yet been implemented on a large-scale because the effectiveness of such a policy is unclear. Given low spruce growth rates in high-latitude regions like Norway, notable CO_2 removal benefits from large-scale spruce planting would not be realized until the second half of this century, with a peak in maximum benefits occurring even later (around 2150) (Bright et al., 2020). Hence, this policy would not help Norway achieve the 2030 LULUCF target or even the long-term target of becoming climate neutral by 2050.

Since 2016, a subsidy scheme for nitrogen fertilization has been one

[6] https://www.dn.no/politikk/klima/eu/per-olaf-lundteigen/regjeringen-vurderer-a-bryte-viktig-eu-avtale-om-klima/2-1-1459783

[7] Regulation (EU) 2023/839, article 13.

[8] https://miljostatus.miljodirektoratet.no/tema/naturomrader-pa-land/skog/

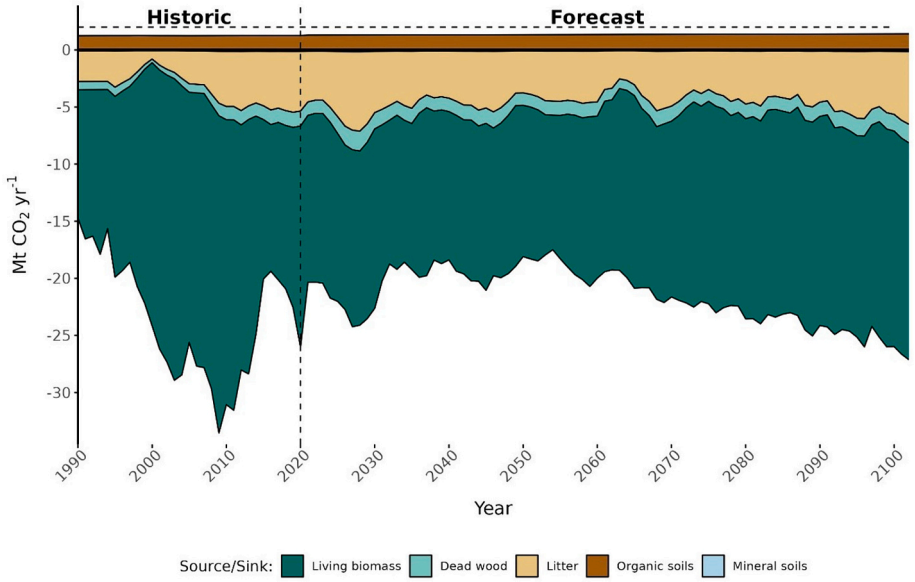

Fig. 1. Norway's historic and projected CO_2 net emissions and removals for each carbon pool from forest land. The figure does not show additional net emissions and removals from harvested wood products (HWP). Adapted from Mohr et al. (2022).

Table 3
Forest protection and forest sink policies in Norway.

	Forest protection policy	Forest sink policy
Policy objectives	Protect representative types of forests and at least 10% of the productive forest area (no target year)	Increase net CO_2 removals: No-debit rule (2021-2025) Net removal (2026–2030)
Policy instruments	Legal protection as nature reserves under the Nature Diversity Act	Subsidies (fertilization, denser planting) and forest management regulations
Implementation	5% of the forestland protected, but not representative types of forests	Norway not on track to achieve LULUFC target
Possible trade-offs across policy areas	More old-growth forest and reduced felling could reduce forest growth and long-term net removals	Fertilization, denser planting, and other forest management measures could be harmful to biodiversity and old-growth forests
Possible short-term vs. long-term trade-offs	No: forests are protected permanently	Yes: a trade-off to increase the forest sink in the short and long term

of the prioritized climate policy instruments in forestry. The government's justification for the measure is that fertilization increases growth and CO_2 absorption in the trees (Norwegian Environment Agency, 2014). Production forest is fertilized once, with 15 kg of nitrogen fertilizer per hectare, approximately ten years before felling. Fertilization is carried out in spruce and pine forests of low and medium quality, where it has the most significant effect on the forest's growth, according to the Norwegian Directorate of Agriculture (2021). The annual subsidy payments have been between NOK 5 and 12 million in 2016–2021. The subsidy rate for 2023 was set at 50% of the cost of fertilizing. There are guidelines for where and how forests can be fertilized (Norwegian Directorate of Agriculture, 2021).

Most fertilization in Norway occurs in three forest-rich regions (Innlandet, Viken, and Trøndelag). The measure has varied somewhat in scope in the period 2016–2022. Activity was most marked in the first years after subsidies for fertilization were introduced and then fell slightly. The peak year was 2017, with over 9000 ha of forest fertilized. In recent years, approximately 6000 ha have been fertilized yearly in Norway. This area is barely 0.7 per thousand of the productive Norwegian forest area. Impacts at the landscape level are, therefore, not a major issue, according to the Norwegian Directorate of Agriculture (2021). Simulations in Sweden have shown that more fertilization could significantly increase forest growth, but as in Norway, the use of fertilization in Sweden is limited because of strict legal requirements (Petersson et al., 2022).

Although forest fertilization only takes place on a relatively limited scale, it is controversial. In 2021, the Ministry of Climate and Environment asked the Directorate of Agriculture, the Norwegian Environment Agency, and the research institute the Norwegian Institute for Bioeconomy (NIBIO) to assess the fertilization scheme. The Norwegian Institute for Nature Research (NINA) was hired to deliver a sub-assignment for the report with NIBIO. They were asked to examine new knowledge about the effects of fertilization on biological diversity acquired since the previous report in 2014 (Norwegian Environment Agency, 2014).

The researchers concluded that nitrogen fertilization negatively affects biological diversity locally and at the landscape level. In the sub-report, NINA and NIBIO showed that species adapted to soils with little nitrogen are negatively affected by fertilization.[9] They maintained that a changed community of plants, insects, fungi, bacteria, and soil fauna will affect the ecosystem's condition, function, and resilience to climate change. The ecosystem and species composition will change, with specialists losing and generalists winning. The researchers also maintained that the long-term climate effect of nitrogen fertilization is poorly known.[10] However, the conclusions from NINA and NIBIO's sub-report were not included in the new main report from the directorates and NIBIO (Norwegian Directorate of Agriculture, 2021).

According to the main report, the fertilization subsidy scheme has had the desired effect and should be continued (Norwegian Directorate of Agriculture, 2021). This conclusion, and the omission of the results from the sub-assignment, prompted four NINA researchers to write an op-ed article where they claimed that "the interests that profit from more intensive forestry dominate the knowledge processes to such an

[9] https://www.altinget.no/artikkel/nitrogengjoedsling-i-skog-forskere-mener-myndighetene-har-neglisjert-deres-funn
[10] https://www.altinget.no/artikkel/nitrogengjoedsling-i-skog-forskere-mener-myndighetene-har-neglisjert-deres-funn

extent that both climate targets and targets to protect species and ecosystems are put at risk."[11] In another media article, NINA's research director expressed concern that "sector interests are overtaking the Ministry of Climate and Environment."[12] The research director criticized the environmental authorities for misrepresenting their research and neglecting their findings, claiming they had made no attempt to counter forestry sector interests.

The policy debate over forest fertilization shows that the forestry sector interests have been joined by the Ministry of Climate and Environment, the Norwegian Environment Agency, and the Directorate for Agriculture in supporting certain forest management measures as climate policy instruments. This policy coalition is unusual, given that the environmental authorities usually advocate for forest protection measures in policy discussions with the forestry sector interests and the Directorate for Agriculture. By contrast, scientists from the nature research community and environmental NGOs have warned that forest fertilization and some other measures to increase forest growth might have severe consequences for forest-dwelling species and ecosystems.

5.3. Implementation

Work with establishing a network of protected forest areas began in 1981, when the government issued a Protection Plan for Coniferous Forests (Ministry of the Environment, 1981). Most of the protected areas have been established on privately-owned forestland, which means that the forest owners must accept strict restrictions on how the land can be used (Gulbrandsen, 2003). The high share of protection on private land is because 85% of the productive forestland is privately owned forests, which supplied 90% of the harvest volume in 2021 (Statistics Norway, 2023). The state does not acquire or buy private land designated for protection, but private owners are compensated economically when their forestlands are protected. Since a voluntary protection scheme was introduced to reduce conflict levels in 2004, nearly all the forest protected on private land has been voluntarily protected. As of 2023, 5.2% of the productive forestland in Norway has become protected.[13]

By 2030, it is primarily reduced deforestation and reduced felling that could contribute to net CO_2 removals from forests (Farstad et al., 2021). Such measures would also enhance forest conservation. Emissions from deforestation— when forests are converted into housing, secondary homes, and other buildings, as well as roads, power installations, and other infrastructure—amount to nearly 3 million tonnes of CO_2 equivalents annually (Søgaard et al., 2021). Deforestation and afforestation (forest establishment in new areas) are not calculated against the Forest Reference Level (FRL). Instead, *all* emissions or removals from the areas are recorded. A reduction in deforestation will thus appear immediately in the Norwegian emissions inventory and can contribute substantially to reaching the target for the LULUCF sector.

Reduced deforestation is possible, but it will be demanding given that critical societal and economic activities are the main drivers of deforestation. Reduced felling would most likely be easier to enforce, but it would reduce economic activity in the forestry sector and the supply of HWP that could substitute for less climate-friendly energy sources and materials (Norwegian Forest Owners' Federation, 2021). Such a strategy would also have consequences for the long-term net removals from forests and, therefore, on Norway's ability to achieve the goal of becoming a low-emission society by 2050 (Ross et al., 2023). Nonetheless, although reduced felling will decrease the stock of HWP and any substitution effects of using forest-based resources, it might be necessary to achieve the 2030 LULUCF commitment (Mohr et al., 2022).

The time inconsistency problem is evident in the report *Climate Cure 2030*, in which various climate measures were assessed (Norwegian Environment Agency, 2020). As previously mentioned, net removals from Norwegian forests planted in the post-war period increased until 2009 but are now declining. It may be possible to reverse this long-term trend by improving forest management efforts, but such efforts will not have a significant effect before the second half of this century (Søgaard et al., 2020). An increase in planting (increased plant density and increased fulfilment of the obligation to rejuvenate), the use of refined plant material, and fertilization could collectively result in an increase in the annual net uptake of CO_2 of around 3.5 million tonnes of CO_2 equivalents in 2100 compared to current practice (Norwegian Environment Agency, 2020; Søgaard et al., 2020). However, such measures could have negative impacts on biological diversity and long-term environmental protection objectives (Norwegian Environment Agency, 2020).

To summarize, the implementation measures that can help Norway achieve the 2030 LULUCF target are primarily reduced felling and reduced deforestation. Those measures are synergistic with forest protection policies. In the longer term, however, forest management measures that may conflict with protection policies may be needed to increase the forest sink capacity. Hence, implementing forest sink policies may be synergistic with forest protection policies in the short-term but not necessarily in the long term.

6. Conclusions

This study has examined how the EU LULUCF has affected the coherence of Norwegian forest policies in a short- and long-term perspective. The policy coherence challenges related to forest sink policies are intertwined and hard to resolve, because policymakers are confronted with trade-offs, conflicting targets, and time inconsistency problems rather than synergies.

Regarding the *vertical* dimension, we observe incoherence between the LULUCF regulation and Norwegian policies because of the Forest Reference Level and the accounting categories in the regulation. These are very unfavorable to Norway, especially for the period 2021 to 2025. Net removals from forests peaked in 2009 but have since been falling, largely because of past management practices and the forest age structure.

A key finding is that the LULUCF regulation has created *temporal* policy coherence challenges in the forestry sector. The LULUCF regulation has established an ambitious target for 2030. In the short term, reaching the target might imply rapidly reducing forest harvest, but this would reduce the supply of harvested wood products that could supplant less climate-friendly materials and energy sources. In a long-term perspective, forest management efforts like denser planting, fertilization, harvesting, rejuvenation, and a change in tree species from low-productive to high-productive forests might be needed to increase the forest sink capacity. Such efforts might not even have a significant effect by 2050 but are most relevant for the long-term goal of the Paris Agreement to "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century" (Article 4 of the Paris Agreement). These short- and long-term policy impacts show that the assessment of coherence critically depends on the time perspective adopted.

Regarding the *horizonal* dimension, we observe potential inconsistencies and trade-offs between forest protection and forest sink policies. Policies for improved forest management might be needed to maximize long-term net removals from forests, but such policies may conflict with policies to protect natural forests and biological diversity. The examination of hearing responses to the LULUCF regulation and policy debates shows that different policy coalitions support different policies to increase forest sinks. The policy coalition advocating for forest protection to increase forest sinks comprises environmental NGOs, biologists, and nature research communities. According to this policy

[11] https://www.morgenbladet.no/ideer/essay/2021/12/28/maktkamp-om-skogbrukets-klimaeffekt/

[12] https://www.altinget.no/artikkel/nitrogengjoedsling-i-skog-forskere-mener-myndighetene-har-neglisjert-deres-funn

[13] https://frivilligvern.no/status-for-skogvernet/

coalition, legal forest protection and reduced felling would both increase the forest sink and enhance biodiversity conservation.

By contrast, the policy coalition supporting improved forest management to increase forest sinks maintains that forest sink and forest protection objectives require different policy instruments and implementation measures. They acknowledge that both policy objectives are important but argue that reduced felling and increased forest protection is insufficient to increase forest sinks over the long term. Instead, they argue that planting, rejuvenation, fertilization, harvesting, and other forest management measures are necessary to increase the terrestrial CO_2 removal potential in the longer run. Such measures are well aligned with the preferred policies of forest owners and forest companies. Indeed, forestry sector interests have regularly promoted improved forest management measures to increase forest growth and yield—long before carbon sinks appeared on the political agenda. Hence, from an interest-based perspective, it is not surprising that the key actors in this policy coalition are the Norwegian Forest Owners' Federation and other forestry organizations, forest companies, and landowners. It is arguably more surprising that they have been joined by the Ministry of Climate and Environment and the Norwegian Environment Agency in supporting certain forest management measures to increase net carbon removals. However, the environmental authorities have some reservations about fully endorsing "improved forest management", particularly if and when the practice plainly conflicts with biodiversity concerns.

Looking beyond forest policy, this study lends support to a political and ideational approach to studying policy coherence (Kurze and Lenschow, 2018; Bocquillon, 2018). Studies that merely examine the coherence of policy outputs are likely to miss the inherently political nature of problem definitions and the interests involved in the framing of policy conflicts or synergies. This study indicates that what is framed as a conflicting or mutually supporting policy depends on political objectives and economic interests. In this sense, it is critical to recognize that assessments of policy coherence cannot be reduced to a technical-instrumental investigation of policies that purport to achieve common objectives. Policy coherence studies should always pay attention to who has the political power to define problems, policy objectives, and policy synergies—and how such framing is linked to political and economic interests.

CRediT authorship contribution statement

Lars H. Gulbrandsen: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The author declare that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The work has been conducted as part of the ClimaLand project, coordinated by the Fridtjof Nansen Institute and funded by the Research Council of Norway (grant no. 344308).

Data availability

No data was used for the research described in the article.

Acknowledgments

An earlier version of this paper was presented at a workshop at Heidelberg University in Germany, 12-13 October 2023. The author is grateful for helpful comments from workshop participants and the guest editors of the special issue on climate and forest governance, as well as from David Ellison, Jon Hovi, and Gunnhild Søgaard.

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