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ARV: The potential for a Norwegian financing mechanism for peatland restoration

Bart Immerzeel, Kristin Tolstad Uggen, Anne Catriona Mehlhoop, Astrid Brekke Skrindo, Dagmar Hagen

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Abstract

Immerzeel, B., Tolstad Uggen, K., Mehlhoop, A. C., Brekke Skrindo, A. & Hagen, D. ARV: The potential for a Norwegian financing mechanism for peatland restoration. NINA Report 2303. Norwegian Institute for Nature Research.

This report describes the results of a fact-finding mission on the key opportunities and challenges for developing a new financing mechanism for peatland restoration in Norway, called ARV. The aim of such a mechanism would be to create a business model for parties to invest in nature restoration, for which they would receive financial renumeration over time in the form of credits, which represent the value of climate gas emission reduction and potentially other ecosystem services. Such a mechanism could help scale-up nature restoration projects and thus assist Norway in fulfilling its commitments to the Paris Climate Agreement and the Aichi Targets under the Convention on Biological Diversity.

The basis of this fact-finding mission was a literature study combined with a set of key stakeholder interviews. These interviews were held with both representatives of potential Norwegian stakeholders in the mechanism (The Norwegian Forest Owners Association, the Norwegian Environment Agency, Nordre Follo municipality, Sparebank1 Østlandet and the Norwegian Nature Inspectorate) as well as representatives of organisations managing similar mechanisms in other countries (The UK's Department for Environment, Food & Rural Affairs and the International Union for Conservation of Nature).

Key findings of the report are that even though there is uncertainty regarding the amount of restorable peatland in Norway, low estimates already suggest that significant reductions in carbon emissions can be achieved by large scale peatland restoration. A financing mechanism would include an identification stage, a pre-restoration stage, a restoration stage, a monitoring stage and a verification stage. It would also require a platform for linking landowners and potential investors, for monitoring the restoration project and for establishing a payment mechanism. After verification of the restoration project's success, investors would receive renumeration over time in the form of credits that can be traded or used to offset emissions. Discussions with representatives from organisations managing similar mechanisms in other countries indicate that such a mechanism can be scalable, but technical capacity-building for restoration and monitoring is one of the key determinants in allowing for growth. Legislation regarding land-use change should also be taken into account. Another challenge is the inclusion of co-benefits from other ecosystem services, such as biodiversity improvements. Markets for these are as of now not well established, but to reduce the risk of further environmental degradation it is key that such co-benefits are also included in the mechanism's verification process.

The report includes the recommendation to start a pilot project. This would give the opportunity to develop and test the elements necessary for establishing the mechanism, potentially up to the distribution of preliminary nature restoration credits, and to test the possibilities for integrating the mechanism into public ecosystem accounting and carbon accounting. This would also allow for stakeholder engagement beyond the preliminary discussions that were part of this fact-finding mission. Based on the discussions conducted for this report, there is interest from both public and private partners to engage in the development of a pilot project, but a wider range of stakeholders, including the national government and local communities, would have to be involved more closely as well.

The report concludes that such a mechanism has the potential to scale up peatland restoration, yielding significant benefits to Norway's nature restoration and climate change goals. A study of successful examples in other countries and preliminary discussions with stakeholders indicate that a pilot project would be a worthwhile next step in engaging stakeholders and further developing and testing the tools required for setting up the mechanism.

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Sammendrag

Immerzeel, B., Tolstad Uggen, K., Mehlhoop, A. C., Brekke Skrindo, A. & Hagen, D. ARV: Potensialet for en norsk finansieringsmekanisme for restaurering av myr. NINA Rapport 2303. Norsk institutt for naturforskning.

Denne rapporten beskriver resultatene av et utredningsoppdrag om de viktigste mulighetene og utfordringene for å utvikle en ny finansieringsmekanisme for restaurering av myr i Norge, kalt ARV. Målet med en slik mekanisme vil være å skape en forretningsmodell for aktører som investerer i naturrestaurering, og som over tid mottar økonomisk godtgjørelse i form av kreditter som representerer verdien av klimagassreduksjoner og potensielt andre økosystemtjenester. En slik mekanisme kan bidra til å oppskalere naturrestaureringsprosjekter og dermed hjelpe Norge med å oppfylle sine forpliktelser i henhold til Parisavtalen og Aichi-målene under Konvensjonen om Biologisk Mangfold.

Grunnlaget for dette utredningsoppdraget var en litteraturstudie kombinert med en rekke intervjuer med sentrale interessenter. Disse intervjuene ble holdt med både representanter for potensielle norske interessenter i mekanismen (Norges Skogeierforbund, Miljødirektoratet, Nordre Follo kommune, Sparebank1 Østlandet og Statens Naturoppsyn) og representanter for organisasjoner som forvalter lignende mekanismer i andre land (Storbritannias Department for Environment, Food & Rural Affairs og International Union for Conservation of Nature).

Hovedfunnene i rapporten er at selv om det er usikkerhet knyttet til hvor mye myr som kan restaureres i Norge, tyder lave estimater allerede på at det er mulig å oppnå betydelige reduksjoner i karbonutslippene ved å restaurere myr i stor skala. En finansieringsmekanisme vil omfatte en identifiseringsfase, en pre-restaureringsfase, en restaureringsfase, en overvåkingsfase og en verifiseringsfase. Det vil også kreve en plattform for å knytte sammen grunneiere og potensielle investorer, for å overvåke restaureringsprosjektet og for å etablere en betalingsmekanisme. Etter at det er verifisert at restaureringsprosjektet er vellykket, vil investorene motta godtgjørelse over tid i form av kreditter som kan omsettes eller brukes til å kompensere for utslipp. Diskusjoner med representanter fra organisasjoner som forvalter lignende mekanismer i andre land, tyder på at en slik mekanisme kan være skalerbar, men teknisk kapasitetsbygging for restaurering og overvåking er en av de viktigste faktorene for å muliggjøre vekst. Lovgivning om arealbruksendringer bør også tas i betraktning. En annen utfordring er inkludering av gevinster fra andre økosystemtjenester, for eksempel forbedringer av det biologiske mangfoldet. Markedene for disse er foreløpig ikke godt etablert, men for å redusere risikoen for ytterligere miljøforringelse er det viktig at slike gevinster også inkluderes i mekanismens verifiseringsprosess.

Rapporten inneholder en anbefaling om å starte et pilotprosjekt. Dette vil gi mulighet til å utvikle og teste de elementene som er nødvendige for å etablere mekanismen, potensielt opp til utdeling av foreløpige naturrestaureringskreditter, og til å teste mulighetene for å integrere mekanismen i offentlige økosystemregnskap og karbonregnskap. Dette vil også gjøre det mulig å engasjere interessenter utover de foreløpige diskusjonene som var en del av dette undersøkelsesoppdraget. Basert på diskusjonene som ble gjennomført i forbindelse med denne rapporten, er det interesse fra både offentlige og private partnere for å delta i utviklingen av et pilotprosjekt, men et bredere spekter av interessenter, inkludert nasjonale myndigheter og lokalsamfunn, må også involveres tettere.

Rapporten konkluderer med at en slik mekanisme har potensial til å oppskalere restaurering av myr, noe som vil gi betydelige fordeler for Norges naturrestaurerings- og klimamål. En studie av vellykkede eksempler i andre land og foreløpige diskusjoner med interessenter tyder på at et pilotprosjekt vil være et verdifullt neste skritt for å engasjere interessenter og videreutvikle og teste verktøyene som kreves for å etablere mekanismen.

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Contents

List of key terms and abbreviations

ARV – A proposed mechanism for engaging private investment in nature restoration in Norway (from the Norwegian word ‘arv’, in English ‘heritage’.

Certification – Recognition by the certifying agency that a project has followed the requirements for generating verified credits.

CO2e – CO2 equivalent. A metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential.

DEFRA - The Department for Environment, Food and Rural Affairs (United Kingdom).

EU – European Union.

GEST – Greenhouse gas emission site types. The MoorFutures approach to quantifying GHG emissions reductions based on vegetation.

GHG – Greenhouse gas.

GS VER – Gold Standard Voluntary emission reductions. Gold Standard’s program for GHG credits.

IUCN UK PP - The International Union for Conservation of Nature UK Peatland Programme.

KDD - Ministry of Local Government and Regional Development (Norway). Responsible for the housing and building, regional and rural policy, municipal and county administration and finances, and the conduct of elections.

KLD – Ministry of Climate and Environment (Norway). Responsible for carrying out the climate and environmental policies of the Government.

LDir – Norwegian Agriculture Agency. Agency under jurisdiction of LMD, responsible for executing and managing government policy under LMDs responsibility.

LMD – Ministry of Agriculture and Food (Norway). Responsible for agriculture, forestry and food in Norway.

MDir – Norwegian Environment Agency. Agency under jurisdiction of KLD, responsible for managing Norwegian nature, climate and preventing pollution.

NGEO – Nature-based global emissions offset. A form of emissions offset that includes effects on enhancing and protecting biodiversity.

NGO – Non-governmental organization.

PCU – Peatland Carbon Unit. A carbon credit under the Peatland Code representing a verified gain reduction of emissions or removal of one tonne of CO2e.

PIU – Pending Issuance Unit. A carbon credit under the Peatland Code representing a ‘promise to deliver’, before verification of carbon gains.

SNO – Statens naturoppsyn. Norwegian Nature Inspectorate.The Norwegian Environment Agency’s operational field agency.

TSVCM - Taskforce on Scaling Voluntary Carbon Markets.

UNFCCC - United Nations Framework Convention on Climate Change.

Validation - A post-restoration check on whether the restoration method applied adheres to the standard set by the certifying agency.

Verification - the process of checking whether the restoration actually yields emission reductions over time, through regular monitoring.

VCS – Verified Carbon Standard. Verra's program for GHG credits.

VCU – Verified Carbon Unit. Verra's credit for reduction of emissions or removal of one tonne of CO2e.

VM – Verra Methodology. A document outlining the prescribed methods for restoration under Verra's standards.

Foreword

This report was commissioned by Equinor Energy AS to provide an exploratory overview of the benefits, risks, opportunities and challenges for developing and implementing a new financing mechanism for peatland restoration in Norway. It is based on a literature review and a series of stakeholder interviews, focusing on experiences with similar mechanisms in other countries and the legal, political and technical aspects in the Norwegian context. The work was done by Kristin Tolstad Uggen, Astrid Brekke Skrindo, Anne Catriona Mehlhoop, Dagmar Hagen and Bart Immerzeel at the Norwegian Institute for Nature Research (NINA). The review, interviews and writing were done in the period September 2022 - April 2023 in Oslo.

We thank all the stakeholders we interviewed for their willingness to give some of their time and expertise, without which this report would not have been possible. We would also like to thank Lajla Tunaal White for contributing her expertise to the report and Jørgen Rosvold for overseeing the project.

We are grateful to Louise-Marie Holst, Aksel Alstad Mogstad, Anne-Laure Szymanski, Abigail Pocock and Jesamine Bartlett from Equinor for good and constructive contact, their active participation in the interviews and for giving good advice to improve the review and the report. They were always willing to meet and discuss the progress of the research.

We are grateful for the commission and support from Equinor and hope the work will be useful as a basis for further cooperation.

Oslo, April 17th, 2023

Bart Immerzeel
Researcher, project manager

1 Introduction

Norwegian society is committed to reducing its greenhouse gas emissions significantly in the coming decades (Norwegian Climate Change Act[1]). The implementation of a wide range of measures will be necessary to approach the goal of 50-55% emissions reduction compared to 1990 by 2030. One of the potential measures is peatland restoration. When peatlands are drained (with the aim of converting wetland to productive agricultural or forestry land), the soil's contact with the air causes it to release CO_2. Rewetting such drained wetlands can potentially significantly reduce Norway's greenhouse gas emissions. However, limited access to public financing can be a barrier for landowners and other stakeholders to carry out and scale up wetland restoration projects. A mechanism for attracting private financing could be a viable way to overcome this barrier.

This report summarises the findings of a research project, which had the objective to assess the viability of a new natural capital financing mechanism in Norway, called ARV, and to conduct the factfinding necessary to establish how to make ARV a reality in terms of policy, legal terms, logistics, ecology, and climate. In addition, the project assessed the potential for a pilot restoration project to demonstrate the potential of ARV for peatland restoration within Norway, in terms of advancing research, climate change and biodiversity loss mitigation, and as a vehicle for engaging local communities and stakeholders.

The focus of this factfinding study is on peatlands, since these are both ecosystems under great pressure as well as potential sources of large carbon emission reduction and carbon capture after restoration. Since carbon is the one ecosystem service from restored nature that has an established market, testing viability for this type of ecosystem and this specific benefit is a logical first step in establishing viability for a financing mechanism for nature-based solutions that can benefit climate mitigation and adaptation. However, this report also discusses possibilities for expanding the mechanism to other ecosystem types and ecosystem services.

Chapter 2 provides the relevant background information to the project. Chapter 3 describes the methods we used to establish our findings. Chapters 4 to 8 describe the results of the factfinding study, and Chapter 9 summarises and concludes the report.

[1] Act relating to Norway's climate targets (Climate Change Act) - Lovdata

2 Background

2.1 Disturbed peatland in Norway

Unlike our neighbours in the UK, Ireland, (northern) Sweden and Finland, Norway does not have large landscapes of disturbed wetlands and peatlands. Instead, Norway has a mosaic of smaller peatlands all over the country. Peatland habitats amount to at least 9% of the land area, and an estimated 22% of all the carbon stored in Norway (Bartlett et al., 2020; Joosten et al., 2015). Historically, draining peatland for forestry and agriculture have been subsidised by the government and municipal councils and there have been no rules against conversion to farmland, building development and infrastructure on peatlands until recently (see Fig.1 for examples).

Estimates of the total amount of peatland in Norway, and how much of it has been drained for agricultural and forestry use or converted to built-up area, vary considerably (Bartlett et al. 2020, Joosten et al. 2015). Joosten et al. (2015) estimates that around 150-200 years ago, the total area of peatlands in Norway was around 44,700 km^2. They estimate that around 7,000 km^2 has been drained since then. However, the latest National Inventory Report to the UNFCCC registers around 18,000 km^2 of undrained wetlands with organic soils and around 3,200 km^2 of drained organic soils. Accepting this range of uncertainty of how much total peatland there is and how much of it is drained, these numbers make clear that in any case a significant amount of peatland has been drained over time. Joosten et al. (2015) estimate that the carbon release of damaged peatlands in Norway adds up to 5.55 million tonnes of CO_2e per year (around 10% of Norway's total emissions), of which 1.11 million tonnes is lost from drained forest and 4.33 million tonnes from drained croplands. In addition, land conversion and building development on peatlands reduces ecosystem services such as water retention and biodiversity benefits.

The most important factor in restoring a peatland and reducing emissions is raising the water table through rewetting (Huang et al., 2021). Techniques for successful peatland restoration have been developed over the last decades both in Norway and other Nordic countries. Best practice guidance on this is available in order to facilitate contractors and ensure efficient use of funding[2]. However, this process can initially have varied effects on different greenhouse gas (GHG) emissions, with much variability between current land uses/habitat alterations as the peatland has dried out over time: In Norway, the estimated rate of emissions reductions following rewetting is greatest for croplands (<33.1 $tCO_2e\ ha^{-1}\ yr^{-1}$), then grasslands (6-26.4 $tCO_2e\ ha^{-1}\ yr^{-1}$) and 1.2 – 8.6 $tCO_2e\ ha^{-1}\ yr^{-1}$ for peatlands that have been forested, based on climatic zone, drainage level and soil type (Joosten et al., 2015). Research from Scotland on restoration of drained heathland and grassland suggests an emissions reduction of 1.32 t $CO_2e\ ha^{-1}\ yr^{-1}$ (Aitkenhead et al., 2021).

Whilst nationwide mapping of peatlands and improved documentation of the extent of drainage is necessary in order to achieve more precise national emissions estimates, models based on field data are beginning to provide more certainty in the effects of peatland management on total greenhouse gas emissions (i.e., Huang et al., 2021). Rough estimates from the literature as described above show that restoration of Norway's drained peatlands can potentially help the country reach its goal of reaching 50-55% emissions reduction by 2030 as compared to 1990 (Norwegian Climate Change Act[3]) by preventing up to 10% of annual emissions, though the range of uncertainty for this estimate is large.

[2] NINA Brage: Restaurering av myr. Overvåking av tiltak i 2021
[3] Act relating to Norway's climate targets (Climate Change Act) - Lovdata

Figure 1. a) *Agricultural peatland drained with ditch.* ***b)*** *Excavation of peatland for an access road. © Magni Olsen Kyrkjeeide*

2.2 Carbon markets and restoration

Whilst there are existing methods for estimating an economic value of an ecosystem through the services it provides us, currently the only true market value on intact nature is in tonnes of carbon. This provides an opportunity for ecosystem restoration to pay for itself through the generation of carbon credits. The global carbon credit market is worth an estimated €760 billion (Refinitiv, 2021). The EU is the biggest market, accounting for almost 90% of the global market, with EU carbon currently trading at 97 euros per tonne (11th April 2023[4]). Nature-based global emissions offset credits (NGEOs), meaning credits generated by voluntary mechanisms coming from nature-based solutions, typically trade for less, currently at an average of around 3 dollars per tonne[3]. Voluntary mechanisms administered by national and regional governments, such as the UK's Peatland Code and the MoorFutures system in Germany, are currently smaller in scale but trade credits between around 15-70 euros per tonne[5]. The Taskforce on Scaling Voluntary Carbon Markets (TSVCM) believes that carbon markets will need to increase in scale - 15-fold by 2030 - in order to meet climate targets and necessary decarbonization to limit climate change (TSVCM, 2021). Norway's Centre for International Climate Research (CICERO) state that it is impossible for Norway to reach its own climate goals without massive offsetting activities through carbon markets (Fig. 2) (Hermansen and Lahn, 2019). Both organisations thus emphasise how insurmountable tackling climate change will be without utilizing market forces.

[4] Live Carbon Prices Today, Carbon Price Charts • Carbon Credits

[5] PFES-Template_rePE-Moorfutures.pdf (foresteurope.org), For Buyers | IUCN UK Peatland Programme (iucn-uk-peatlandprogramme.org)

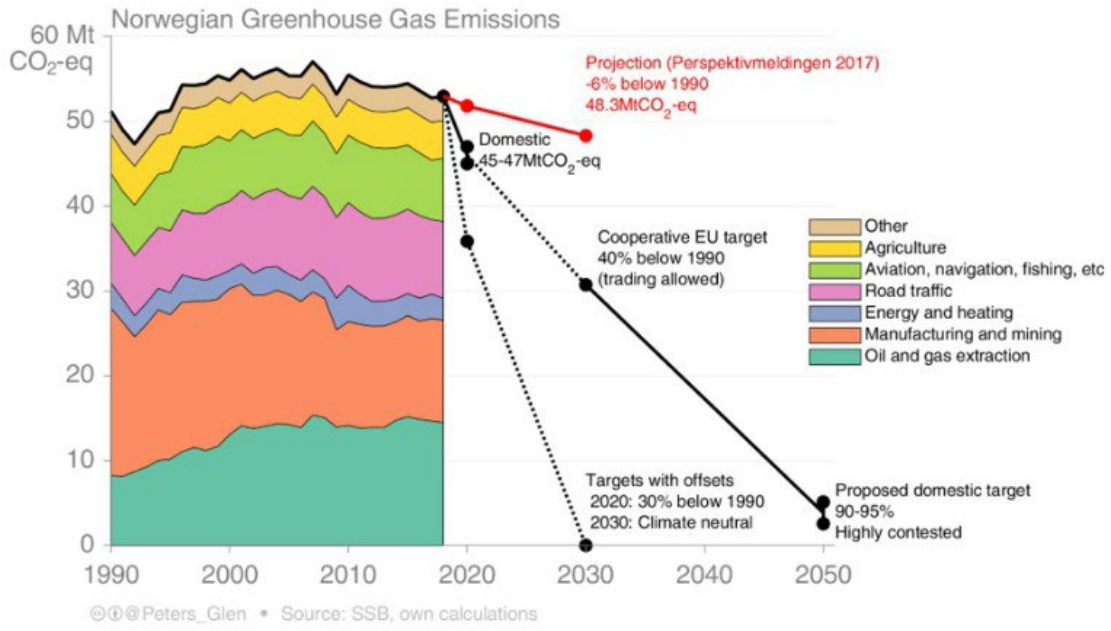

***Figure 2**. Norwegian GHG emissions and projections for the future – note the dotted line showing the need for carbon offsets as a mechanism for reaching climate neutrality (CICERO, 2019).*

Understanding the tradable value that carbon markets open for restoration and afforestation projects, several initiatives act as mechanisms/brokers between ecological projects, and 'carbon buyers'. The world's largest overseer of carbon credit projects is 'Verra' in the US. It has issued over 600 million Voluntary Carbon Units (VCU credits, with each credit being a metric tonne of CO_2e), mostly to forestry projects, but most recently 970,000 to 'blue carbon projects', largely mangrove restoration and preservation (Verra - Standards for a Sustainable Future). Verra have now recently expanded their suite of ecosystems to include coastal wetland conservation, but less terrestrial wetlands. Only 3% of all of their projects are in Europe (Data and Insights - January 2022 - Verra).

In the UK, the International Union for Conservation of Nature (IUCN) UK Peatland group with support from Department for Environment, Food and Rural Affairs (DEFRA), launched The Peatland Code. It is a voluntary certification standard for UK peatland projects wishing to market the climate benefits of peatland restoration and provides assurances to voluntary carbon market buyers that the climate benefits being sold are real, quantifiable, additional and permanent. They operate based on the natural capital financing structure developed for them by Economics for the Environment Consultancy (EFTEC) (Fig 3). In this structure, private actors can invest into a managed fund, which feeds into an investment pool. This pool can then cover restoration and management costs for peatland landowners and managers. These actions provide benefits in the form of ecosystem services, which can be monetised in a variety of ways:

- Carbon emission reduction can yield carbon credits over time, which can be used for offsetting investors' emissions, or can be traded on the carbon market.
- Water quality improvements can reduce drinking water production cost for investors that produce drinking water.
- Flood risk mitigation can reduce costs of flood prevention measures for downstream industries that invest in the fund.

The Peatland Code is currently facing two main challenges. Firstly, the only benefit that can be monetised at the moment is carbon emissions reduction, for which the mechanism has a system of verified carbon credits. Other benefits are not yet included in the mechanism, reducing the potential pool of interested investors. Secondly, for peatland owners, the risks of reducing income from other land use, like agriculture, are large compared to the benefits they might receive

from restoration projects. This is partly caused by uncertainty in the amount and timing of carbon emission reductions generated by restoration.

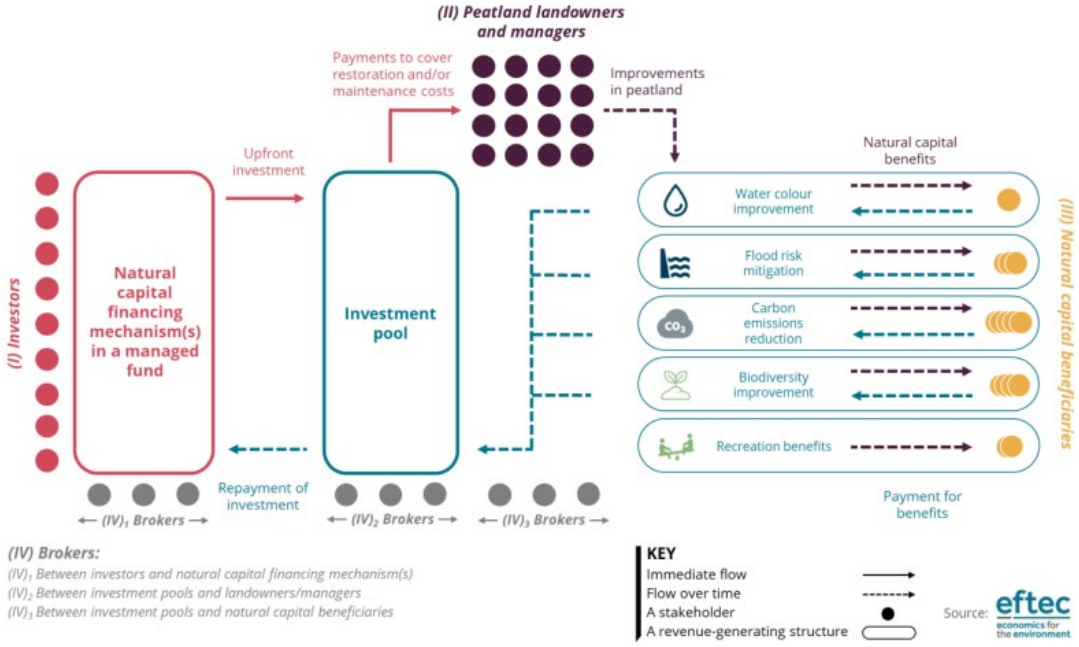

***Figure 3**. Simplified natural capital financing structure for peatland restoration projects, where stakeholders (I-IV) are represented equally. Source:* Natural capital financing for peatland_eftec_final_311018_0.pdf (iucn-uk-peatlandprogramme.org)

The Peatland Code was based on the previously established Woodland Carbon Code[6], which generates carbon credits for afforestation projects that bind carbon in biomass. There is a conceptual difference between the two: The Woodland Carbon Code aims at binding carbon from the atmosphere, while the Peatland Code aims to reduce the emission of carbon from the soil. For climate mitigation, reducing emissions and binding carbon are equally as important, but there are potential political differences: the binding of carbon by forests is arguably more publicly acknowledged as an important measure, requiring less public education to generate political pressure, though this is speculative and needs further research.

Although the Peatland Code is the first known implementation of such a financing mechanism, other initiatives are discussed and being piloted, such as MoorFutures[7] in Germany and Valuta voor Veen in the Netherlands[8]. These are more limited projects operating under the same basic principles as the Peatland Code.

In Norway, there is a national plan for wetland restoration from 2021-2025, under administration of the Norwegian Environmental Agency (Miljødirektoratet, 2020). The overarching goal of this restoration plan is to restore 15% of drained wetlands by 2025. In identifying wetlands to be restored, an important consideration is that restoration needs to be voluntary and cannot lead to conflict with agricultural and forestry-related stakeholders. Selection of areas is further based on drainage intensity, peat depth and vegetation cover. In addition, it gives an assessment of average cost of restoration projects so far at 420 000 kr and monitoring costs for ecological condition at 500 000 kr per inspection. So far, the wetland restoration plan has only resulted in a number of small and medium size restoration projects (mainly filling ditches) in protected areas and some

[6] Home - UK Woodland Carbon Code
[7] MoorFutures - Klimaschutz trifft Biodiversität - Home
[8] Home - Valuta voor Veen

non-protected areas owned by Statsskog (publically owned forests), as this land is more likely to be legally and logistically available for restoration. In 2022, 31 peatlands in total were restored by blocking 71 km of ditches[9]. The Norwegian Environment Agency (Miljødirektoratet) is currently expanding its restoration into non-protected state-owned land, giving prospects for larger restoration initiatives. They are also considering a mechanism for expanding peatland restoration activity through inclusion of more private landowners and improved financial incentives will be important to attract private landowners to provide land for restoration projects. However, public funding will always be limited and there is scope for private financing of nature-based solutions such as wetland restoration. Whilst the plan does not include offsetting through restoration, it addresses how to prioritize between different areas and includes information about knowledge gaps that will be very useful for developing a mechanism of restoration for returns through the carbon market.

2.3 Norway's Natural Capital potential

Whilst Norway has a good track record in some areas of natural capital accounting, this has largely been driven by industries such as fishing and forestry. An important basis for natural accounting and ecosystem-based management of Norwegian nature is to have agreed maps with full coverage of the main ecosystems. This is still lacking in Norway. The classification system NiN (Nature Types in Norway (biodiversity.no)), and systems for ecological condition such as Nature Index, the Water Framework Directive and terrestrial systems for ecological condition will, in time, fill the gaps with NINA also working on ecosystem accounting as part of the economic system (Naturregnskap (nina.no)). Similarly, Norway still has ground to gain with regards to carbon accounting and reporting within these ecosystems: As identified in NINA's report on 'Carbon storage in Norwegian ecosystems' (Bartlett et al., 2020), many of the gaps in our understanding of carbon potential in Norway come from poor mapping of many ecosystems, including those who are highly carbon valuable such as peatlands/wetlands. Filling this knowledge gap is key in estimating the likely benefits of peatland restoration on a national scale.

The aforementioned report also highlights the high carbon value of multiple ecosystems, and that Norway's current climate strategy in the context of ecosystem management relies for a large part on one ecosystem – planted forests (see Rusch et al., 2022). When assessed by carbon stored by area, forest is not the most valuable ecosystem, and current National climate solutions do not consider the impacts of forest-focused climate measures on biodiversity (Rusch et al., 2022). The range of carbon rich ecosystems in Norway (Fig. 4) means that there are a variety of available natural climate solutions that will benefit an even larger range of native biodiversity in addition, with peatland preservation and restoration being one of the most valuable ecosystems by area.

[9] Våtmarkene kommer tilbake – 31 myrområder reparert i 2022 | Miljødirektoratet (ntb.no)

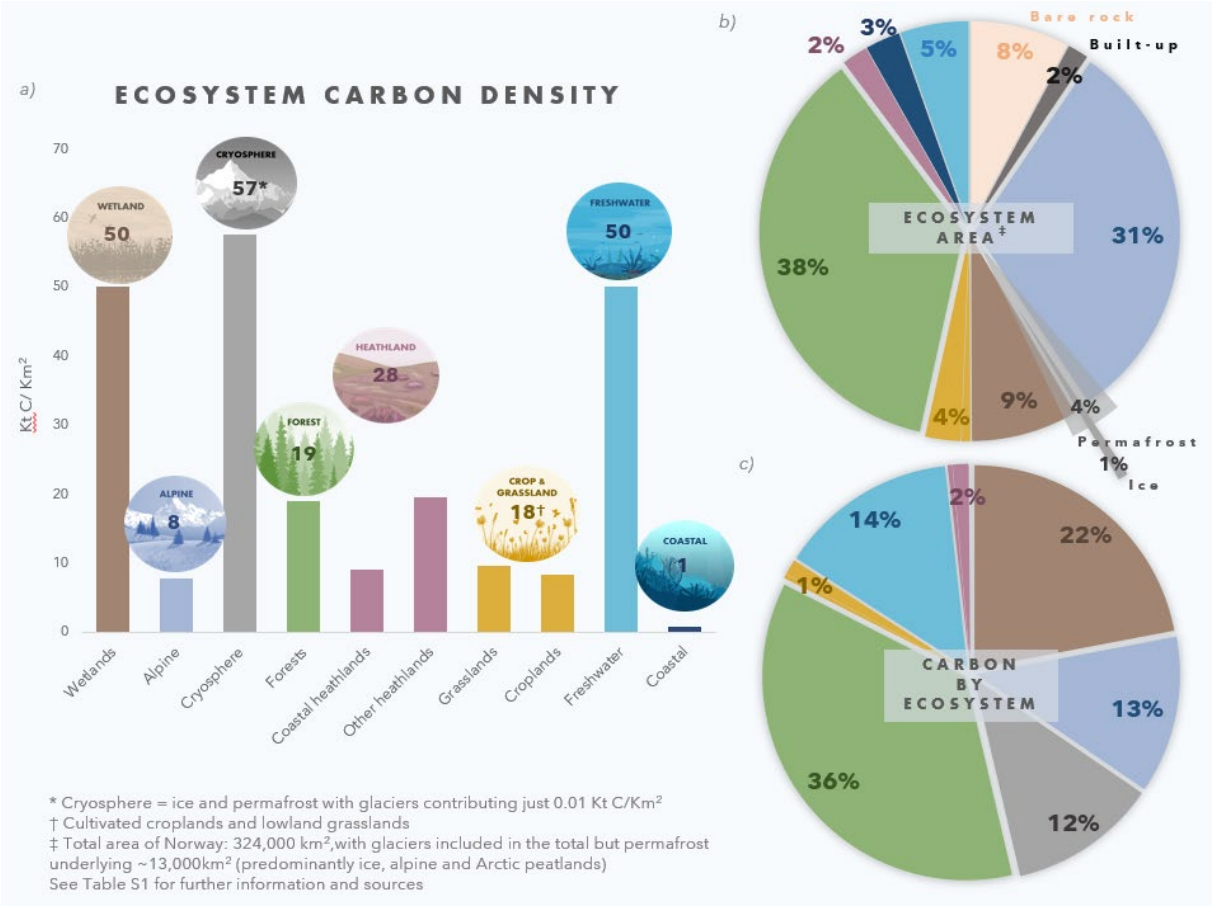

***Figure 4**. Estimated carbon storage in Norwegian ecosystems. **a)** Norwegian ecosystem carbon storage density (kg C m-2), shown with its constituent elements: **b)** the area proportion (%) of ecosystem/land cover types; and **c)** carbon storage estimates for each ecosystem, excluding 'built-up' and 'bare rock' area types, which do not have such data available. For communication purposes, lowland grasslands and cultivated land (crops) are colour grouped, as are both 'coastal' and 'other' heathland types (Rusch et al., 2022; Bartlett et al., 2020)*

Even with the uncertainty and knowledge gaps, the potential for restoration in Norway is large, with much wetland, peatland, tundra, and old forest impacted by human activities. As far as we are aware, there are no Norwegian companies working in natural capital financing for the benefit of Norwegian ecosystems. So far, both the Norwegian government and offsetting companies have instead incentivized or managed afforestation/deforestation prevention projects abroad, with mixed long-term potential for true carbon storage and questionable societal benefits for those local communities (e.g. Green Resources AS, see analysis from the Oakland Institute: Setting the Record Straight on Green Resources' Project in Uganda | The Oakland Institute).

Access to the carbon credit market could be a mechanism to secure private funding for large scale restoration projects, as well as act as a lobbying force to encourage the Norwegian government to invest in domestic carbon stocks and consider the entire diverse range of Norwegian ecosystems, and the biodiversity therein, as part of its natural asset portfolio. NINA recently published the 'Naturkur' – a joint climate and nature solution providing a holistic set of measures and suggestions that go far beyond the original 'Klimakur 2030' established by the Norwegian Government (Rusch et al., 2022). The Naturkur principles are that climate measures, cannot and in fact do not need, to be at the expense of biodiversity and ecosystem health. Inclusion of a wider range of ecosystem services into a nature restoration financing mechanism would allow it to tackle multiple policy goals at once (carbon emission reduction and reversing biodiversity loss through nature restoration).

2.4 'ARV' mechanism

A short summation of the previous paragraphs reveals the following:

- Norway has a large area of drained peatlands. Restoring these can deliver a significant contribution to the country's climate goals. If we assume that we restore only half of the damaged peatlands in Norway, according to Joosten et al. (2015), this can reduce emissions by around 2.7 million tonnes of CO_2e per year, or around 5% of Norway's annual total emissions. However, these estimates are uncertain, and further study on the area of total and degraded peatland in Norway are essential for estimating the potential for scaling up peatland restoration.
- Restored peatlands also provide a range of other ecosystem services that are valuable to society, such as biodiversity gains, water quality improvement and flood risk mitigation.
- A key challenge for peatland restoration is financing its cost. A number of mechanisms in other countries aim to attract private financing to restoration projects to overcome this barrier. These mostly focus on generating marketable carbon credits as pay-out to investors.

Taking these points together indicates that a financing mechanism for peatland restoration for Norway can potentially be a viable part of Norway's climate and nature restoration goals. The ARV mechanism aims to create a method for attracting private financing to peatland restoration projects. The basic concept is borrowed from the Peatland Code: private investors will be able to finance restoration projects, for which they receive a stream of income over time in the form of verified carbon credits. In the following chapters, we discuss whether and how such a mechanism could be implemented in Norway, taking into account the political, legal and regulatory context.

3 Methods

This report presents an assessment of the potential of a natural capital financing mechanism in Norway by first following four primary threads:

1. To give an overview of the Norwegian political, legal and institutional framework within which the financing mechanism would exist.
2. To describe the current peatland-specific methods for verification that yield carbon credits, based on established practice by verification organisations and other natural capital financing mechanisms.
3. To develop a preliminary set of restoration and financing mechanisms. This covers the definition of what the restoration process should include, which indicators will be used for assessing a project, and how to monitor and evaluate the project. We also assessed the viability of a digital platform for practical implementation of the financing mechanism.
4. To explore the opportunities and barriers for implementation of the mechanism within technical, political and financial context, based on experience from similar mechanisms in other countries and interviews with Norwegian stakeholders.

The knowledge gathered within these threads was then used to:

1. Suggest a pilot restoration project to demonstrate the mechanism in practice.
2. Conclude with an assessment of the viability of a natural capital financing mechanism in Norway.

The first step in the process was to identify sources of information necessary for performing the abovementioned tasks. These consisted mostly of stakeholders, supplemented with information from grey literature. Over the course of the project, the following stakeholders were identified and interviewed, each of which either provided relevant knowledge and experience from other mechanisms, or is a key stakeholder in the implementation of a Norwegian financing mechanism:

- The UK Department for Environment, Food & Rural Affairs (DEFRA)
- The International Union for Conservation of Nature (IUCN)
- The Norwegian Forest Owners Association
- The Norwegian Environment Agency
- Nordre Follo municipality
- The NGO Sabima
- SNO (Norwegian Nature Inspectorate) and the County Governor of Innlandet
- Sparebank1 Østlandet

Please note that the interview with employees at the Norwegian Environment Agency was an exploratory discussion without involvement of the leadership from the Agency, and therefore any points taken from that meeting do not reflect the Agency's official standpoints.

For each of these interviews, a list of questions was set up to cover the relevant threads mentioned above. See Appendix A for an overview of conducted interviews. Partners that have not been interviewed due to the limited scope of this study are nevertheless discussed in Chapter 4.

Additionally, information in grey literature, such as NINA's own research reports and guidance documents on similar systems such as the Peatland Code[10] and MoorFutures[11], was used to fill in remaining knowledge gaps.

The following chapters describe the findings of this study in order of the threads as described above.

[10] Peatland Code | IUCN UK Peatland Programme (iucn-uk-peatlandprogramme.org)
[11] MoorFutures - Klimaschutz trifft Biodiversität - Home

4 Political, legal and institutional frameworks

The potential for restoration of peatlands in Norway depends on national and local political agendas as well as existing legislation and regulations concerning landowner rights, nature protection, agriculture and forestry. In this chapter, we sum up key legislation and stakeholders, including an assessment of how they relate to ARV.

4.1 Politics, legislation and regulation

In December 2022 Norway signed the Kunming-Montreal Global Biodiversity Framework[12], but the agreement is not yet operationalised into specific targets for Norwegian wetlands. The National Plan for Wetland Restoration (2021-2025), under administration of the Norwegian Environment Agency (Miljødirektoratet, 2020), was established as a plan for implementing wetland restoration in Norway. It is therefore an important document for ARV to align to. This plan is a result of Norway's commitments to the Aichi Targets as agreed to under the Convention on Biological Diversity[13]. Target 15 states that participating states need to restore at least 15 percent of their threatened ecosystems. This led to Norway's National Action Plan for Biodiversity[14], which is operationalised in the National Plan for Wetland Restoration. Key points from the Plan that are relevant for the development of ARV are:

- The goals of wetland restoration are primarily for reducing GHG emissions, improved climate adaptation (such as water storage capacity) and improvement of ecological condition.
- Wetland restoration cannot come into conflict with stakeholders from the agricultural and forestry sector.
- Wetland restoration will only be based on voluntary action from landowners.
- Restoration measures will be cost effective.

These points serve as operating boundaries for the ARV mechanism on the one hand, but also serve as an opportunity: creating new financial incentives can increase the interest of landowners to restore wetlands voluntarily.

Norway is a signatory to the Paris Climate Agreement and has anchored their commitments under the agreement to law with the Climate Change Act. This Act contains two targets: a reduction of greenhouse gas emissions compared to 1990 of 50-55% by 2030, and a reduction of greenhouse gas emissions compared to 1990 of 90-95% by 2050. This piece of legislation is important for ARV because its ambitious targets imply all possible measures of greenhouse gas reduction need to be considered, including the reduction of emissions from drained peatlands.

In 2020, the regulation under the Norwegian Land Act (Jordlova) was changed so that new conversion of wetlands to agricultural land is no longer allowed.[15] This change along with new political focus on wetlands, shows that there is a shift towards legislation aimed at protecting and restoring wetlands, giving further legal context to the urgency of peatland restoration.

The Nature Diversity Act came into force in 2009[16]. The purpose of this Act is to protect biological, geological and landscape diversity and ecological processes through conservation and sustainable use. This act will work in parallel together with the other area-based regulations and is important for ARV, specifically for ensuring that land-use change stemming from a restoration project does not degrade biodiversity.

[12] COP15: Final text of Kunming-Montreal Global Biodiversity Framework | Convention on Biological Diversity (cbd.int)
[13] Convention on Biological Diversity (cbd.int)
[14] Meld. St. 14 (2015–2016) - regjeringen.no
[15] § 5a Nydyrking av myr - Landbruksdirektoratet
[16] Nature Diversity Act - regjeringen.no

Access to land is a key issue for implementing the financing mechanism, and this relates to a number of acts and regulations. Restoring peatland means that land-use will be changed, and the rights and values of the land will be different than prior to restoration. This will have significant implications for the actual performance, as further addressed in this chapter and Chapter 6 (barriers).

The Norwegian Building and Construction Act and agricultural laws (such as the Land Act and Forestry Act) put very strong regulation to present and future land-use. When a privately owned area is regulated as either forest or for agricultural purposes, even though the area originally was a peatland, there is a need for a re-regulation before restoration can start. It is hard to predict how easy or difficult it will be for landowners to change this, but SNO and the County Governor of Innlandet are willing to share their experience to overcome this barrier. A pilot project combined with close collaboration with SNO and the Country Governor, as we suggest in this report, can help to shed light on the challenges this legislation will pose for rolling out ARV.

4.2 Key actors

The Ministry of Climate and Environment (KLD)
KLD has the responsibility to implement the government's policy regarding climate and environment, including GHG emission reduction and protection of biodiversity (see the previous section). It is therefore an important party to include in setting the goals and verification standards for a national Norwegian nature restoration financing mechanism.

The Ministry of Agriculture and Food (LMD)
LMD has the responsibility to implement the government's policy regarding both agriculture and forestry (see the previous section). Since drained peatlands most often are regulated as either agricultural land or forests, the policy and regulation concerning these are key factors, making LMD vital discussion partners for designing the ARV mechanism.

The Ministry of Local Government and Regional Development (KDD)
In Norway, area planning is done on the regional and local level. KDD has the responsibility to implement the government's policy regarding area planning in collaboration with municipalities. Since peatland restoration in some areas would require a change in area-category in municipalities' land use regulation, this is an important partner in regulating ARV.

The Norwegian Environment Agency (MDir)
MDir is responsible for executing and managing government policy under KLDs responsibility. They work on a wide range of environmental topics, including monitoring and reduction efforts of GHG emissions and mapping, monitoring and management of Norway's nature areas and biodiversity. Since MDir is responsible for monitoring Norway's GHG emissions as well as the extent and condition of its ecosystems, linking the ARV mechanism's verified emission reductions to MDir's systems and regulations is a key part of developing the mechanism on a national scale.

The Norwegian Nature Inspectorate (SNO)
SNO is an executing unit within MDir, and conducts inspections, monitoring, information, guidance, and operative management in protected and other important natural and cultural heritage areas. SNO have been the leading unit for performing the on-site peatland restoration within the National Plan for peatland restoration. They can be an important part in setting up the technical restoration guidelines for the ARV mechanism.

The Norwegian Agriculture Agency (LDir)
LDir is responsible for executing and managing government policy under LMDs responsibility. It is the competent authority on many issues concerning forestry and agriculture, including implementing legislation on land use and subsidy payments for example conservation and restoration

activities on farmland. What role in ARV LDir should play is as of yet unclear, but when further developing the project in practice, this agency needs to be one of the parties to consult.

County Governor
The local County Governors are involved in several restoration projects initiated by the MDir/SNO as a part of the National wetland restoration plan. The County Governors have both an advisory role as well as a governmental role in area plans. It is important for ARV to include them together with SNO.

Municipalities
When setting aside peatland for restoration, it is important that local communities support the project. Experience with work in the Peatland Code showed that if landowners do not take into account local stakeholders, conflicts can arise. E.g. if the water table changes as an outcome of restoration efforts this can have effects on surrounding areas for instance, and changing land use can have an effect on land prices and use of land. Municipalities can play a supporting role in engaging local stakeholders in the community, making them important partners in the process. They can also play a role as landowners.

Landowners
Most of the peatland in Norway is privately owned. This means that for peatland restoration, private landowners would have to be interested in converting part of their land to restored nature. This land can be in productive use, either for agriculture or forestry. However, significant areas of privately owned land are also unproductive, because converting them to productive land would be too expensive to cover the income generated from producing crops or timber. Due to structural changes within agriculture within the last decades, Norway also has large areas of abandoned farmland, parts of these are previously drained peatland. For landowners to be interested in restoration, they need to have assurance that they will not lose out financially in doing so, for example obtaining gains in the form of carbon credits for their own financial contributions to restoration.

Investors
Landowners typically do not have access to financial capital to undertake restoration efforts on their land. For this reason, organisations and industries with an interest in generating carbon credits can use the carbon financing mechanism to supply financial capital to restoration projects, in return for access to the land.

Financial institutions
Banks can take on a role in assessing risk and cash flow for customers and also help with interim financing if this is needed. A deferred or reduced cash flow from forest owners can be accepted if it is due to them entering restoration projects. Banks can aid in developing criteria for restoration so that it can qualify for green loans with better conditions for financing.
It is also relevant to take a role in relation to the handling of payments from customers, payments to landowners so that risk and cash flow become manageable and predictable for all parties.

Verifiers
Verifiers are organisations engaged to perform verification of projects and their supply of carbon credits (see chapter 5). These can be globally operating organisations, such as Verra[17] or Gold Standard[18], or they can be verifying bodies directly tied to a restoration program, such as the Peatland Code.

Restoration ecologists – both researchers and practitioners

[17] Home - Verra
[18] The Gold Standard

Restoration ecologists are engaged to design and perform the restoration, and to propose and perform evaluation and monitoring programmes to verify the ecological outcome and benefits (further on this in chapter 5).

5 Carbon Credit Verification

For a wetland restoration project to yield financial benefits in the form of carbon credits or other forms of financial capital, restoration outcomes need to be verified by a recognised verification standard. Carbon credits are a well-established form of financial capital. Carbon credits generated from nature restoration that is verified to reduce emissions or sequester carbon from natural areas can therefore be bought and used to offset industry emissions or traded for profit at a later time. Other forms of natural capital improvements, such as biodiversity or water quality gains, can hypothetically also be converted to a form of financial credit through verification of gains. However, current nature restoration schemes, such as the Peatland Code, do not yet include such other forms of natural capital due to the fact that measurement and verification standards for biodiversity do not yet exist. On a global scale, restoration projects that include co-benefits like biodiversity protection and improvement typically trade their carbon credits for higher prices, suggesting such co-benefits can yield monetary benefits.

The Peatland Code is the most well-established nature restoration mechanism for peatland on a national level that includes carbon credit verification. The information in this report is based on version 1.2 of the Peatland Code. However, a new version of the Code, 2.0, will become mandatory from June 2023. The main change is the expansion of the Code to include fens, while previously only projects on bogs could be permitted. Detailed changes to the new version of the Code are not included in this report.

Carbon credit verification under the Peatland Code is done in three steps: first, a pre-restoration baseline is set up for the project. Then restoration is performed and the restoration is validated as having been performed according to the Peatland Code requirements. Finally, after restoration periodic monitoring is performed, which yields to verification of the project. Verification of the results is done by independent bodies accredited or working towards accreditation by the UK National Accreditation Body. Before verification but after validation, a project can provide Pending Issuance Units (PIU), which are 'promises to deliver' emission reductions. These can be used to plan for future emission offsetting. After verification, these PIUs are converted to Peatland Carbon Units (PCU), each of which represents a tonne of CO_2e emission saving that is verified. These can be traded and used to offset emissions. See this link for an overview of the payment mechanism under the Peatland Code. As of the writing of this report, 27 projects have been validated, with a projected emissions reduction of over 900,000 tons CO_2e, yielding an equivalent number of Pending Issuance Units (PIUs)[19]. Currently, the first verification rounds are underway. The first verification round happens after 5 years, then every 10 years, based on project length (based on peat depth), with a minimum 30 years and maximum 100 years.

Under the Peatland Code, plans are made to integrate other benefits from peatland restoration through the concept of stacked units. If an ecosystem service has a credible voluntary standard for measurement and can be integrated into the Peatland Code additionality calculator, it can be stacked unto the already existing carbon credit to increase financial benefits generated by nature restoration. As of now, such standards do not yet exist under the Peatland Code. However, Wilder Carbon, a private enterprise in the UK, developed a Carbon + Habitat tool for measuring the wider natural capital benefits of restoration projects, that includes carbon sequestration in biomass, carbon emissions reductions as well as biodiversity[20].

In Germany, the MoorFutures[21] initiative is similar to the Peatland Code in that it allows investment in peatland restoration to generate verified carbon credits. Within MoorFutures, work is also being done on integrating biodiversity benefits from peatland restoration into a credit generation

[19] Peatland Code Projects Summary | IUCN UK Peatland Programme (iucn-uk-peatlandprogramme.org)
[20] Carbon + Habitat Tool - KWT Consultancy Services
[21] MoorFutures - Climate protection meets biodiversity - Home

scheme. The basic concept revolves around the identification and monitoring of specific species that indicate ecosystem health. However, models for all species groups are not yet available (see section 6.4 for further details).

Verra is an organisation based in Washington D.C. in the USA, which developed a standard for certifying carbon emissions reductions. They operate in a broad range of projects, with a majority being reforestation projects, and have developed methodologies for projects on rewetting drained peatlands[22]. However, the number of registered projects using one of Verras methodologies for rewetting peatlands (VM0027 or VM0036) is currently limited to one in Verra's project registry[23]. In recent years, journalists have also reported negatively on Verra's carbon offsetting methodology[24], and called into question the actual carbon offsetting gains these credits represent[25]. Whether or not these allegations are accurate or not, the debate highlights the need for rigorous project-based approaches, tailored to domestic conditions, with a strong focus on digital transparency and regular monitoring that focuses on correct baselines and reference sites.

Alongside the ongoing process of an EU regulation on nature restoration[26], standards are developed and adjusted to fit different countries ecosystems. Norway is not a part of EU but will be affected by the upcoming law. This gives greater weight to the option of developing a verification method specific to the ARV mechanism for Norway, as the Peatland Code and MoorFutures have done for their respective mechanisms.

[22] Methodologies - Verra
[23] Verra Search Page
[24] Carbon offsets used by major airlines based on flawed system, warn experts | Carbon offsetting | The Guardian
[25] Revealed: more than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows | Carbon offsetting | The Guardian
[26] The EU #NatureRestoration Law (europa.eu)

6 Restoration mechanism

In this chapter, we propose an outline of principles for a mechanism for peatland restoration. This is based on experiences gained in the Peatland Code and MoorFutures, as well as interviews with Norwegian stakeholders.

Both the Peatland Code and MoorFutures have detailed restoration guidelines to ensure the effectiveness of restoration efforts (Joosten, Brust et al. 2015, Smyth, Taylor et al. 2015). These form a proven basis for setting up a financing mechanism for peatland restoration, but also an opportunity for learning from their challenges. This chapter also assesses how to adapt a mechanism to specific Norwegian ecological and legal conditions. This chapter forms a basis that can be further developed under a pilot project set up to test the assumptions and methods described here.

We propose a mechanism in multiple steps, described in more detail in the following sections. The methods and tools for each of the steps in the mechanism will be developed by a wide range of stakeholders. The mechanism will also involve key actors to implement and run each of the steps. These are shown in Figure 5.

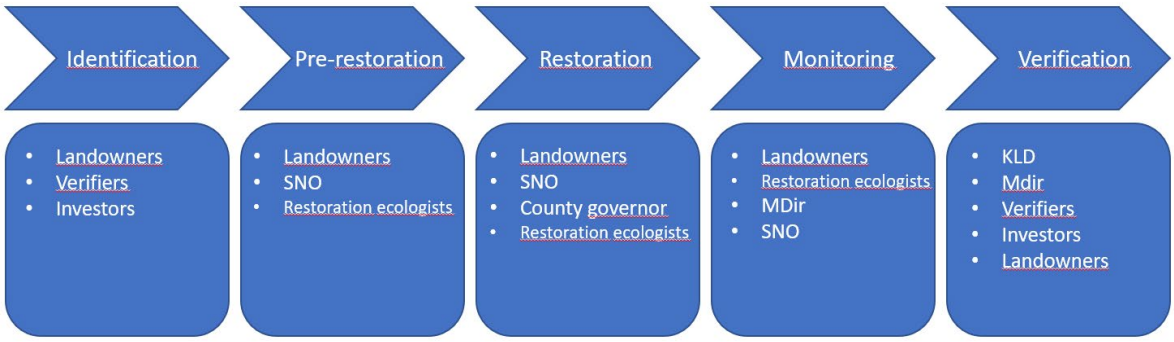

***Figure 5**. Flowchart of the steps in the restoration mechanism and the main actors involved in each.*

6.1 Identification stage

In the Peatland Code, landowners can register their land online if they want to participate in the Peatland Code mechanism. After registration, the next step under the Peatland Code is to identify if registered projects are eligible for validation and verification. This should also be the first step in a Norwegian system after project registration.

The Peatland Code has the following basic conditions that need to be met, in order for a project to be eligible for validation/verification:

1. Peat soils must be greater than 50cm in depth
2. Peatland type must be blanket or raised bog
3. Peatland condition must be 'Actively Eroding' or 'Drained' (See Field Protocol for definitions)
4. Restoration activities must not include forestry removal
5. Restoration must not be legally or contractually required
6. Project must be able to enter a minimum contract of 30 years
7. Restoration activities must not conflict with any other land management agreements
8. Project must be additional i.e.; it must require carbon finance to take place (would not happen without financing)

Some of the steps in this process will need to be adapted to a Norwegian system. For instance, the first condition requiring a minimum depth of 50 cm for the peat soil could be different in Norway depending on the potential for restoration and carbon effects. Many of the peatlands that

have so far been prioritised for restoration in Norway are raised bogs (2nd condition). The plan further is, however, to include as many of the different peatland types as possible, especially fens, since there are many degraded fenlands in Norway and there is good restoration potential with carbon and ecosystem benefits. There may also be the need to account for differences in the possible need for changes in land-use; many Norwegian peatlands have been drained and then afforested, so that “forestry removal" (4th condition) may be a necessary restoration activity. Condition 6 states that projects must be able to enter a minimum contract of 30 years. This can also be a realistic timeline in Norway: The Norwegian Nature Inspectorate has an agreement with Statskog where the restored land is protected for 40 years after restoration.

6.2 Pre-restoration stage

Both the Peatland Code and MoorFutures suggest parts of the following workflow for the pre-restoration phase:

- Grid-based survey of the area to estimate:
    - Peat thickness
    - Peat type and condition
    - Water table
    - Possibly: water quality
    - Possibly: biodiversity

This could also be an appropriate workflow in a Norwegian system. A new tool that could be of use specifically for estimating the current carbon stocks and potential effects of restoration is NINA’s new CarbonViewer (Cretois, B. et al., 2022)[27]. This tool allows for estimation of carbon stocks in a project area, based on peat thickness measurements.

However, interviews with Norwegian stakeholders showed that for many of them it is very important to also include biodiversity in the pre-restoration survey in order to better follow the development over time. This is an important aspect to ensure that the principles of nature-based solutions are maintained by securing multiple benefits through restoration activity e.g. in accordance with the IUCN criteria for Nature-based solutions. How many and which indicators to include in such a survey will need to be decided based on scientific literature and expert knowledge. Choice of indicators might also depend on the type of peatland (e.g., raised bog, fen). This needs to be developed and tested in a pilot project.

6.3 Restoration stage

Much of the restoration work on peatlands in Norway has so far been conducted by the Norwegian Nature Inspectorate. One of their tasks is to prepare manuals/guidelines for restoration work on peatlands and other wetlands, as well as to carry out restoration measures in the field[28].

In general, the most important restoration work is the hydrological restoration (rewetting) of the peatland. This usually includes removal of drainage, plugging of ditches and removal of trees and shrubs (e.g. Price, Evans et al. 2016). In addition, revegetation measures (spreading of propagules) can be conducted (e.g. Minayeva, Bragg et al. 2016, Hunth, Günther et al. 2022) in order to facilitate establishment of desired species, such as peatmosses. Both restoration approaches are applied in Norway[29], although spreading of peatmoss fragments is still experimental, and will likely be followed up with a new study by NINA this year.

The Norwegian Nature Inspectorate is also responsible for the implementation of monitoring of these restoration measures in protected areas.

[27] CarbonViewer (nina.no)
[28] Statens naturoppsyn (SNO) - Miljødirektoratet (miljodirektoratet.no)
[29] Plan for restaurering av våtmark i Norge (2021-2025) - Miljødirektoratet (miljodirektoratet.no)

6.4 Monitoring stage

Monitoring of restoration measures is important for several reasons. Without monitoring, it is not possible to evaluate the restoration outcome, and hence, the effect on climate and the ecological effect. In the case of a financing mechanism, this evaluation of restoration outcome is very important to be able to verify if the restoration work is satisfactory.

The Peatland Code and MoorFutures have some monitoring methods in common (Joosten, Brust et al. 2015, Smyth, Taylor et al. 2015). In both systems, the greenhouse gas emissions are not directly measured, but based on comprehensive analysis of literature on (annual) GHG fluxes of the different peatland types (MoorFutures uses the GEST approach, Peatland Code has its own approach). To monitor the biodiversity and condition of the peatlands, both systems use common monitoring methods, but try to keep them as simple as possible.

- MoorFutures focuses on monitoring of the effect of rewetting on biodiversity. They use species that can rapidly colonise new habitats, are indicators of a wide range of peatland conditions, and are relatively simple and cheap to monitor. For their locally specific peatlands, they suggest focussing on vascular plants and mosses, birds, amphibians, and arthropods. The number of indicator species on site could then be modelled. However, models are not yet available for all species groups and would therefore need to be developed specifically for the Norwegian ecological context.
- The Peatland Code focusses rather on peatland structure and uses so called Condition Categories to assess peatland condition, in addition to the variables recorded under the pre-restoration work. Condition categories are: near-natural, drained, eroded and cutover, modified, and re-wetted, which all have their own set of indicators. Monitoring efforts after restoration are 5 years after project completion, after which every 10 years for the Peatland Code.

In Norway there are almost no projects that monitor GHG emissions on restored peatlands, yet. Hence, literature is scarce and estimations of GHG emissions of different peatlands are rough. A suggestion on how to improve this is given in chapter 6.6.

Norway has developed two main types of peatland restoration monitoring of effects on biodiversity: one extensive and one intensive method (Lunde 2022, Table 1). The Norwegian Nature Inspectorate uses the extensive method in their monitoring, while NINA uses the intensive monitoring on a subset of restored peatlands.

Table 1. *The two main types of peatland restoration monitoring in Norway.*

Intensive method	Data on species composition, peatland structure and dominant functional plant groups in both restored and reference sites
Extensive method	Simplified; data on presence of *Sphagnum* species, but other plant functional groups may also be recorded

The intensive method collects data on species composition, peatland structure and dominant functional plant groups in both restored and reference sites. The extensive method is a simplified version of the intensive method and focused on collecting data on presence of *Sphagnum* species, but other plant functional groups may also be recorded. This, however, depends on the expertise of the people collecting the data and hence is not standardised over the projects. A pilot project could assess which of these methods, or a more tailor-made approach, would be most effective for ARV.

In the interview conducted with the Norwegian Nature Inspectorate, it was mentioned that SNO is open to share their experiences of both restoration work and monitoring when working with private landowners (Appendix A). It's therefore important to include them in developing the monitoring protocol.

6.5 Emission calculator

Calculation of the restoration effects on GHG emissions can be done using data on peatland condition acquired during monitoring and linking these to look-up tables for carbon emission reductions under these conditions. As long as the values in these look-up table are based on scientifically established values with an acceptable range of uncertainty, the use of look-up tables is an effective way of calculating emission reductions with limited effort required from the monitoring body.

The Chrichton Carbon Centre established a peatland carbon metric for use under the Peatland Code, for which they did a literature review of studies that monitored GHG emissions from peatlands under varying levels of degradation for a period of up to nine years (Smyth, Taylor et al. 2015). The collected values were analysed to yield average values and 95% confidence intervals for each peatland condition level, which were then used as look-up values for the restoration emission calculator. Emissions from three GHGes are measured: carbon dioxide, methane and nitrous oxide, which are added up to yield a net CO_2e emission effect. These net effects per peatland condition type (near-natural, drained, eroded and cutover, modified, and re-wetted) are currently used as inputs for calculating emission effects under the Peatland Code protocol.

A similar system can be set up for Norway. However, we identified two key disadvantages to the system used by the Peatland Code:

- The peatland condition categories only take into consideration general peatland condition under five condition levels that can be assessed with a basic visual inspection, and do not differentiate according to land cover, peat thickness and water table. This increases ease of use for monitoring a large number of restoration projects, but it reduces the reliability of the estimates.
- The emission data found in the literature review was limited and could not provide statistically robust estimates for all condition types, leading to large confidence intervals. This means that average emission estimates for condition type are likely to over- or underestimate the actual emission from restoration.

For a Norwegian emission calculator, we suggest improving the input data that emission levels per peatland condition type are based on, to yield more accurate average estimates. Previous studies on GHG emissions and sequestration in Norwegian wetlands are limited. A key study is De Wit, Austnes et al. (2015), and Norway's Greenhouse Gas inventory does collect data on carbon emissions from wetlands, but neither of those consider differences between peatland condition type in detail. For improving the Peatland Code method, it would therefore be necessary to set up a monitoring program of GHG emissions of different peatland condition types. This would however require a multi-year monitoring program to yield statistically robust estimates.

Further improvement of the Peatland Code method would include establishing estimates not only for peatland condition categories, but also for water table, peat thickness and land cover. This would improve the quality of the estimates, but would make monitoring and verification more time consuming, as well as sensitive to measurement errors in the field. Here, NINA's new CarbonViewer (Cretois, B. et al., 2022), as mentioned in 6.1, could be of use as well.

In light of the above discussion and taking into consideration the need for an easy-to-use system for a large number of restoration projects, we propose the following recommendations for an emission calculator for ARV:

- A spreadsheet based emission calculator based on look-up tables for peatland condition types, similar to the system set up for the Peatland Code. The calculator should include estimates for carbon dioxide, methane and nitrous oxide, summed up to CO_2e values. These condition types should be easy to estimate in the field based on visual inspection and limited monitoring effort.
- A literature review on the state-of-the-art on peatland GHG emissions under specific condition factors, such as peat thickness, land cover, restoration status and water table. Depending on the findings this could be supplemented by a monitoring project for representative peatlands in Norway. The knowledge gathered here can be used to improve the emission calculator's accuracy under different peatland condition levels.

6.6 Verification stage

For the verification of credits generated by a future Norwegian financial carbon credit mechanism, two options exist:

- Established verification organisations are engaged to perform verification for ARV. Several international organisations provide verification services that supply certified carbon credits. Verra[30] and Gold Standard[31] are two of the main actors globally, supplying Verified Carbon Standard (VCS) credits and The Voluntary Gold Standard (GS VER) credits respectively. Linking the ARV mechanism to a standard from one of these or another verification organ would provide a large verification capacity, reducing the risk of delayed project verification due to limited capacity. It would however require additional work to align the ARV process to the chosen verification standard, such as Verra's methodologies for peatland restoration (VM0027 and VM0037[32].

- A new verification organisation is established specifically for the Norwegian financing mechanism. This is the same strategy as the Peatland Code applied, in which verification is only done by two national verification organisations that are specifically tailored to verifying under the Peatland Code. These are OF&G Organic[33] and Soil Association[34]. Benefits to this method are access to local knowledge and verifiers and opportunity to tailor verification mechanisms specifically to ARV. However, experience from the Peatland Code has shown that setting up or working with national verification organs can lead to a bottleneck in capacity, producing backlogs of projects that have yet to be verified. Accreditation of the organisations will also be an extra step in the process under this method. As an alternative within this option, an existing organisation with relevant mandate, can be expanded to cover for this task.

As discussed in Chapter 5, partnering with a global organisation comes with the benefits of a well-established mechanism that includes protocols for restoration and verification, but also challenges regarding protocol adaptation to the Norwegian context, effectiveness of restoration projects and reputational issues. There is no European standard or well-established mechanism in Europe that we can adapt. But we are aware of the development of new standards regarding the upcoming EU restoration law that might be suitable for our purpose as well. These standards may also be implemented as indicators for the EU taxonomy. Until the European standards are ready, we believe it to be wise to develop a tailored verification system for Norway and we therefore suggest following the model as used by the Peatland Code and Moorlands, and developing a verification and credit generating mechanism specifically for ARV, but at the same time critically taking into account the latest state of the art from various sources, including those from global standards such as Verra.

[30] Home - Verra
[31] The Gold Standard
[32] Methodologies - Verra
[33] Organic Certification, News, Classified ads, Useful information | OF&G (ofgorganic.org)
[34] Peatland Code (soilassociation.org)

We suggest the testing of a pilot restoration project based primarily on assessing carbon effects by monitoring under a similar regime as the Peatland Code currently does. At the same time, NINA can use the pilot to test existing systems for monitoring biodiversity (and potentially other ecosystem services), or develop new ones if necessary. NINA has many projects and pilots with different monitoring methods for biodiversity, such as the Restoration Quality Toolbox – a plot project about quality assessment of restored peatlands in Norway. Results from this can be used to propose a combined credit system that includes a range of natural capital benefits into its value in addition to the carbon value. This will take the next step necessary to get complete assessment and credits for carbon and environmental values together. Valuable partners for establishing such a credit system are the Norwegian Environment Agency and SNO, who can help giving authority and quality assurance to the issued credits. The Norwegian Agricultural Authority may also be a necessary partner to ensure sector involvement and buy-in.

6.7 Digital platform and payment app

For rolling out a financing mechanism for nature restoration at the national level, systems for registration, restoration, monitoring and verification as described in the previous paragraphs have to be secure as well as easy to use for a wide variety of users. Digital platforms can be a helpful tool for giving multiple types of stakeholders access to the relevant information for a project. We suggest a platform containing the following three portals for covering all of the mechanism's needs:

1. Registration portal. This would be a publically accessible system for registering projects for restoration, where potential investors can find projects they are interested in and landowners can find potential investors for funding. This portal would have two functions: firstly, to assess whether a project would be eligible for funding according to a list of (yet to be determined) criteria, based on the information a landowner provides when registering their potential project. And secondly, to connect potential projects to potential funders. The Peatland Code has a similar portal available, which can be accessed here. Other sources of inspiration can be Restor, a map-based portal developed by the Crowther lab[35], Zulu Forest Sciences' portal[36] or Plan Vivo's project portal[37].

2. Project status portal. When a project has been confirmed and received funding, the parties involved will get access to a dedicated project status portal on the platform. Here the pre-restoration work, restoration work and monitoring work can be registered (see paragraphs 6.2-6.4) and accessed by funding parties, the landowner, restoration parties and the monitoring agency assigned to the project.

3. Verification portal. Verification of restoration effects on GHG emission will yield carbon credits to the investing parties, divided according to the ratio of financial investment. An overview of the invested funds and the number of credits the project generates will be accessible on this platform. The verification agency can use this portal to distribute credits to the parties involved. This portal could also be linked to public climate emission accounts, such as the national Greenhouse Gas Inventories and municipal climate emissions accounts.

All three of these portal are likely to be web-based interfaces integrated into a platform, potentially including a map-based interface comparable to Restor's system. For ease-of-use, especially during the restoration and monitoring phase including fieldwork, an app can also be developed to access the platform. Good data security is a prerequisite, especially when

[35] https://restor.eco/
[36] Zulu Forest Sciences
[37] Projects | Plan Vivo Foundation

it comes to the distribution of carbon credits. Setting up such systems as apps would make the process more easily accessible and is technically possible, but would require investment. Public-private financing could be explored with the authorities as this up-scaling of restoration activity has the potential to better enable the achievement of national climate and biodiversity targets.

6.8 Ownership, responsibilities and oversight

For ARV to become a national platform for financing peatland restoration, it needs to be embedded in the current institutional framework regarding land use, nature restoration, natural capital accounting and financial accountability.

This fact-finding study is the first step in designing a full framework for a future national mechanism. Further work is required in order to deliver a full framework of ownership and responsibilities. In this section we discuss some of the relevant elements to develop further
Similar to the Peatland Code being supported by DEFRA, we suggest that ARV should be under responsibility of the Norwegian public authorities. The Norwegian Environment Agency, as the responsible body for monitoring and registering Norway's greenhouse gas emissions and the executive body for Norway's climate policy, could be a logical candidate. This would make it easier to integrate project results into national and municipal accounting systems. Should the authorities not be able to take on this role, an alternative would be for the system to be run by a private entity.

Development and maintenance of the methods and protocols can be under responsibility of NINA, as a leading institute in ecosystem accounting and nature restoration research. It may also be an option to involve partner organisations should the mechanism require additional input.

We suggest verification of the results can be a collaboration between NINA and the Environment Agency. However, this field is in rapid development and the next steps should go into more depth to explore the different options. In addition, NINA can develop verification protocols in collaboration with SNO and the Environment Agency, and act as monitoring agency, with oversight and final accreditation of results falling under the Environment Agency. However, this would require scaling up of capacity in both organisations, so defining responsibility and risk ownership should be a key element in a pilot project. These are different options that need to be discussed with respective parties in the follow up work and future development of this restoration and carbon credit.

7 Opportunities and challenges for uptake

In this chapter we list the key opportunities and challenges for development of the ARV mechanism in Norway, based on literature review and our interviews with stakeholders.

We consider one of the main challenges to ARV's ultimate success to be the access to available land for restoration. This issue has two main components: laws, and attitudes from local landowners. The Norwegian Building and Construction Act and agricultural laws (such as the Land Act) impose very strong regulations on present and future land-use, and has been documented as an obstacle for environmental solutions (Hansen & Aarsæther 2018). These laws can be protective of potential development and agricultural lands with potential and actual use for food production, even if they are degraded peatlands with no current or planned agricultural use. The awareness of these challenges is rising within the public management system, and prospects for future restoration for carbon capture and potential financing mechanisms will likely motivate new initiatives to overcome such challenges within the public sector. Political commitments to achieve national climate and biodiversity targets will also be important in pushing through necessary legislative changes to enable the restoration of wetlands and other carbon-rich ecosystems.

Local landowners, farming and forestry organisations and local communities will be a key to getting access to available land, and this project will need to demonstrate economic viability for landowners. We know of several local municipalities (Kinn, Tønsberg, Drammen) that are positively engaged with carbon accounting through Nature Based Solutions, and are already working towards local measures that will positively benefit the protection and restoration of local peatlands as a priority. By engaging them, and other local municipalities with significant areas of degraded peatland (e.g. Trondheim, Stjørdal, Smøla), we hope to contribute to a positive attitude change to maintaining and restoring peatlands from the local government level upwards.

7.1 Technical and practical

Opportunities

- As described in previous chapters, there is a considerable area of degraded peatlands on unproductive agricultural/forested land with potential for restoration in Norway.
- Remote sensing data has become more widely available, and mapping of ecosystems has become more sophisticated in recent years. This allows for better identification of suitable areas for restoration.
- Peatland restoration itself is not a new technique, and multiple actors in Norway, including potential partners in ARV like Nordre Follo municipality, are familiar with established restoration measures that can be scaled up.

Challenges

- Should restoration projects increase rapidly in number, care must be taken that a workforce will be available to do the restoration work, as well as for carrying out monitoring and verification. This is an issue the Peatland Code ran into that needs to be anticipated beforehand.
- Assessment of restoration effects on climate gas emissions, biodiversity and other ecosystem services need to be further developed within the context of ARV before the mechanism can be scaled up.
- As mentioned in Chapter 6, The pre-assessment figures of carbon emission reductions for any given restoration project are currently a trade-off between accuracy and useability: a detailed assessment of greenhouse gas effects needs a considerable monitoring effort for various types of peatland under various conditions in order to obtain more accurate figures spanning different peatland types. A more basic estimate such as under the Peatland Code can make the mechanism easier to implement and run, but will come

with increased uncertainties regarding actual greenhouse gas reductions achieved (and subsequent basis for valuation).
- Similarly, monitoring of a restoration project and verifying its results in terms of emission reductions needs to be grounded in a scientifically sound method, as well as be practically doable for a large number of projects in the long run. The Peatland Code chose a fairly basic approach based on visual inspection, but even there verification capacity became a bottle neck as soon as the program started growing. A reliable verification method needs to be developed in a pilot program before upscaling can be considered.

7.2 Political and legal

Opportunities
- From discussions with political entities in Norway and from a study on the developments in recent legislation and regulation, it became clear that there is a strong political need for carbon offsetting as a measure to achieve ambitious carbon targets and commitments by 2030 and 2050. A successful pilot project could further enhance the goodwill and impetus that a system like ARV can generate, which is an important element in its upscaling potential.
- On the political, corporate and broader societal levels, there is increasing awareness of the concept of natural capital. The idea that healthy nature provides (quantifiable) value to society and is therefore worth investing in is gaining traction. A peatland restoration financing mechanism is ideally placed to ride this wave.
- Similarly, there is increasing political awareness of the importance of peatlands, both for its value as a carbon sink, its role as an emitter of CO_2 when drained and its biodiversity value.
- There is political will to be involved in a pilot project to test the viability of ARV: Both the Forest Owners Association (private parties) and Nordre Follo municipality (public authority) are willing to contribute to a pilot project by helping to find a suitable site, connecting stakeholders and assisting in the practical implementation.

Challenges
- It will be crucial to clearly define the responsible parties throughout the ARV mechanism. NINA can develop the methods under which the mechanism operates, but considering Norway's institutional set-up, final authority and oversight may need to lie with a public authority.
- The Norwegian Building and Construction Act and agricultural laws (such as the Land Act and Forestry Act) place very strong regulations regarding present and future land-use. When a privately owned area is regulated as either forest or for agricultural purposes, even though the area originally was a peatland, a re-regulation must be carried out before restoration can start. This potentially limits the amount of peatland that is available for restoration or slow the processes down, which can be discouraging for land owners. When developing the mechanism, minimising this barrier will require close coordination with the relevant authorities and stakeholders and potential legal changes or new precedence that can facilitate the process.
- Local community involvement and acceptance of peatland restoration is a prerequisite for the mechanism's success. Experience with the Peatland Code showed that not involving local communities can cause conflict. To prevent this, a clause has been included into the Code stating that there has to be a community consultation before restoration can take place. A similar measure should be considered for ARV.
- The effects of emission reductions by restoration projects should be integrated into national and municipal greenhouse gas accounts. With the ongoing development of national capital accounts that include a wider range of ecosystem services, other benefits of registration should also be integrated into official systems. This requires close collaboration with the relevant authorities.

7.3 Financial

Opportunities

- The main financial opportunity, both for land owners and the authorities, is access to private funding for nature restoration. As dialogue with stakeholders such as Nordre Follo municipality showed, financing restoration projects is a key barrier to expansion. Giving investors financial incentives in the form of carbon (and potentially other) credit pay-outs over time greatly increases the pool of available financial capital.
- After a successful restoration, landowners can expect a steady long-term pay-out of financial benefits over time.
- Restoration projects on wetlands may provide indirect financial benefits for local authorities and land owners in the form of ecosystem services such as water quality improvements, erosion control and flood management.

Challenges

- Restoration projects can potentially fail to generate greenhouse gas emission reductions either in the short or longer term. For forest owners to be interested in restoring part of their lands, they need to have a certain level of security regarding the income the land would provide through the provision of a steady long-term flow of carbon credits. As experience in the UK with the Peatland Code shows, lack of security on income can be a major factor for landowners to not want to be involved in a restoration project. This risk however mainly concerns areas that are currently productive through agriculture or forestry production. Since these are already tightly regulated under the Land Act and Forestry Act, this is not of urgent concern for the early development of ARV. Close consultation with landowners and financing institutions on minimising financial risk can be fine-tuned during the development of a pilot project.
- There is a risk that landowners might postpone already planned restoration work before ARV is implemented if they anticipate larger payments through the new scheme. The Peatland Code included an additionality requirement into their protocol to prevent this: this means a project is only eligible for inclusion in the mechanism if it would only be undertaken with additional financing from the mechanism. In other words, the mechanism only allows projects that would otherwise not have happened. A similar protocol should be included in ARV to prevent the postponement of already planned restoration projects.
- Monitoring costs need to be included into the restoration investment over a long period of time (up to decades). The long time-frame means costs over time are difficult to predict, for example on the development of inflation and labour costs. These should be included in the risk assessment and factored into cost estimates at the start of each project.

8 Pilot restoration proposal

Based on feedback from the Forest Owners Association and Nordre Follo municipality, we assess there is firm interest in starting a pilot restoration project to test the basics of the mechanism in practice.

The following elements would at minimum have to be developed as part of a pilot project:

1. A protocol describing what would be a viable project. This includes information on the types of peatland (land cover, degradation level), expected outcomes (emission reduction), investment need and compliance with the relevant legislation and regulations, such as the Norwegian Land Act.
2. A protocol and platform for registering projects, describing the information that has to be supplied for registering a project. This includes an initial mapping of the restoration area, its physical characteristics, its required funding, its potential CO_2e emission reductions and a risk assessment describing risks of emission reductions not being achieved as well as risks of conflict with other stakeholders, including the local community.
3. A protocol for restoration. This describes how restoration should take place and what the end result should be. Even if natural capital benefits other than carbon emission reduction cannot yet be monetised, the restoration protocol should include the requirements that the restoration at the very least cannot degrade other ecosystem services.
4. A protocol for monitoring the restoration outcome over time. This includes binding requirements on how often to perform monitoring as well as what to measure (such as visual inspection, groundwater levels and ecological condition). This should include an assessment of the viability of including effects of growth of new peat yielding net carbon storage.
5. A project overview platform, giving access to information on the restoration and monitoring status.
6. A preliminary verification protocol and payment mechanism.

A verification protocol and a mechanism for distributing carbon credits does not have to be finalised before starting a pilot project, but should be developed if the pilot project has proven potential for scaling up. Aligning to an established system such as Verra would yield the benefit of limiting the development time for this step and potentially becoming profitable sooner, but developing a new protocol would allow for closer alignment to new EU regulations and tighter inclusion of co-benefits such as biodiversity gains, which would potentially also increase the value of the generated credits. At the same time, dialogue with public agencies responsible for GHG emissions inventories should be initiated as part of the pilot to integrate emission effects into these public inventories.

A pilot restoration project will likely not be able to scale up to become financially profitable. This can be mitigated by including the forward sell of credits to interested parties (or even stakeholders) before they reach commercial scales. InterEarth in Australia is an example of such a scheme, in which the organisation raised $800k in forward selling credits for their novel carbon credit plan. If an agreed methodology is being used, a similar offtake agreement may be possible for ARV.

Since the pilot project will potentially not be financially profitable in the short term, we suggest a relatively small project area. Nordre Follo municipality has made clear that for municipally owned land, there is no need for a project to be financially profitable, which would make a project on their own land a good candidate for a pilot project that does not yield verified carbon credits in the short term. The municipality communicated they are also willing to help in organising the practical side of restoration, have available equipment and have contacts with commercial parties that have experience with restoration. We therefore suggest starting a pilot project with a dialogue with Nordre Follo municipality. Additionally, the Forest Owners Association would like to assist in engaging privately owned land in a pilot as well, for testing the

mechanism in the private context. This means an additional area suitable for pilot restoration can be identified in collaboration with them. If this leads to finding a suitable site, or sites, for restoration, NINA can begin developing the five elements described above. After starting up the project, we will then perform periodical assessments of its progress, and if positive we will develop a verification protocol and mechanism, as well as start up a more intensive dialogue with the relevant parties (such as the Norwegian Environment Agency, KLD, SNO) for scaling up the mechanism and integrating project results into public climate emissions accounting. The financing partners such as Equinor will have a close role in developing the pilot and will be a visible partner in the project. The pilot will need to involve the landowner and buyer (Equinor) in developing the financial mechanism along the same lines as has been done under the Peatland Code. Should carbon credits be generated then Equinor could benefit from this, provided this is addressed in the original agreement.

9 Conclusion

This report presented the results of a fact-finding project with the aim of making a first assessment of the viability of ARV, a new financing mechanism for nature restoration and carbon credit benefits.

Norway has a large area of drained and degraded peatlands. Rough estimates from the literature search show that restoration of Norway's drained peatlands can potentially help the country reach its goal of reaching 50-55% greenhouse gas emissions reduction by 2030 as compared to 1990 (Norwegian Climate Change Act) by preventing up to 10% of annual emissions, (though the range of uncertainty for this estimate is large). In an international context, systems have begun to be developed that provide possibility for private actors to invest in peatland restoration, in return for which they receive verified carbon credits that can be used to offset emissions or can be traded on for money. ARV is a proposed mechanism based on this principle, focusing initially on providing a platform for financing peatland restoration projects in Norway.

An important challenge for upscaling peatland restoration is financing its available funding. The ARV mechanism can contribute to overcoming this barrier by creating a method for attracting private financing to peatland restoration projects. This study provides a preliminary assessment of the viability of such a mechanism for Norway. Key aspects that the study includes are an overview of the Norwegian political, legal and institutional framework within which the financing mechanism would exist, the latest state-of-the-art for peatland restoration, monitoring of results and verification, monetisation systems using verified carbon credits and the possibilities of including other ecosystem services into a payment mechanism for nature restoration. This has led to the provision of a series of preliminary restoration guidelines. Additionally, a pilot project has been proposed for further development and testing of the mechanism in practice.

The main findings from the study are:

- There is still uncertainty in the amount of total and degraded peatland in Norway. However, it is likely significant emissions reductions are possible by increasing the rate of peatland restoration. The latest developments in knowledge generation should be included in any future steps in developing ARV.
- Key stakeholders in Norwegian society, in public administration and in the private sphere, are interested in the potential for ARV to develop as a viable financing mechanism that can contribute to climate targets. They want to be involved in designing its guidelines and integrating it into current systems for nature restoration and natural capital accounting.
- Multiple parties have shown interested in assisting in setting up a pilot project for testing ARV in practice.
- ARV can build on previous experience from the Peatland Code and Moorlands, but needs to consider the specific Norwegian context. The Norwegian Land Act and Forest act for example place restrictions on converting currently productive land for agriculture and forestry into nature restoration. The preliminary guidelines presented in this study aim to provide a starting point for how existing methods can be effectively applied to Norway.
- The preliminary restoration guidelines in this report need to be further developed and tested in a pilot project. We suggest a collaboration with Nordre Follo municipality to find a suitable site for restoration in their administrative area and develop the protocols for ARV further in collaboration with the Norwegian Environment Agency and SNO, as well as stakeholder consultation with landowners and financing institutions, such as Sparebank 1 Østlandet.

We conclude that ARV's success is not yet guaranteed, but has the potential to be a launching platform for more significant peatland restoration across Norway as well as providing a tailor-made mechanism for carbon credits to benefit national financing institutions and authorities. The success of the mechanism depends on generating political will for it, and for that a successful

pilot project is key. Success can be defined by achieving restoration of peatland at a local scale, improved processes for implementation, monitoring and financing. A pilot will by definition need to harvest useful lessons-learned and clear suggestions for improvement when defining the next generation mechanism for scale up.
First discussions with stakeholders are promising. A starting point for the next steps is to reach out to Nordre Follo municipality again to discuss the practical implementation of such a project in their municipality, while at the same time starting dialogue with the Norwegian Environment Agency and SNO (as well as other potential partners) to discuss and further develop their roles and the restoration guidelines as presented in this report. This should be done in cooperation with Equinor in order to secure key input from the financing partner and establishing their interests.

Appendix A - Interviews

Call with DEFRA

This interview was conducted on Teams on 28 October 2022. Present: from the Department of Environment, Food and Rural Affairs (DEFRA) Judith Stuart, from NINA Bart Immerzeel and Kristin Tolstad Uggen and from Equinor Louise-Marie Holst and Aksel Alstad Mogstad.

Call with The Norwegian Forest Owners Association

This interview was conducted on Teams on 31 October 2022. Present: from the Norwegian Forest Owners Association Per Skorge and Ida Aarø, from NINA Astrid Brekke Skrindo, Anne Catriona Mehlhoop and Kristin Tolstad Uggen.

Call with the IUCN UK PP

The interview was conducted on Teams on 21 November 2022. Present: from the International Union for Conservation of Nature (IUCN) Ed Salter, from NINA Bart Immerzeel, from Equinor Aksel Alstad Mogstad.

Call with Sparebank1 Østlandet

The interview was conducted on Teams on 21 November 2022. Present: Sparebank 1 Østlandet: Karoline Bakka Hjertø and Espen Hagestande. From NINA: Kristin Tolstad Uggen.

Call with the Norwegian Environment Agency

This interview was conducted on Teams on 13 December 2022. Present: from MDir Randi Boe, Ida Maria Evensen, Kjell Tore Hansen, Endre Grüner Hofstad, Kine Hopperstad, Vibeke Husby, Anders Iversen, Ida Egge Johnsen, Line-Kristin Larsen, Egil Postmyr, Bente Støholen, Ingrid Kleppenes Verne, from NINA Bart Immerzeel, Anne Catriona Mehlhoop, Astrid Brekke Skrindo, Lajla White and Kristin Tolstad Uggen and from Equinor Louise-Marie Holst and Aksel Alstad Mogstad.

Call with Nordre Follo municipality

The interview was conducted on Teams on 19 January 2023. Present: Nordre Follo: Maja Dineh Sørheim & Anders Berggren, from NINA: Kristin Tolstad Uggen & Bart Immerzeel.

Call with the Norwegian Nature Inspectorate (SNO)

The interview was conducted on Teams on 6 February 2023. Present: from the County Governor (Inland county) Suzanne Wien, from Norwegian Nature Inspectorate Kjølv Øystein Falklev (Inland county) and Pål Martin Eid (Viken county), from Equinor Aksel Alstad Mogstad and Louise-Marie Holst, from NINA: Anne C. Mehlhoop and Astrid Brekke Skrindo.

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NINA Report

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NINA was established in 1988. The headquarters are located in Trondheim, with branches in Tromsø, Lillehammer, Bergen and Oslo. In addition, NINA owns and runs the aquatic research station for wild fish at Ims in Rogaland and the arctic fox breeding center at Oppdal.

NINA's activities include research, environmental impact assessments, environmental monitoring, counselling and evaluation. NINA's scientists come from a wide range of disciplinary backgrounds that include biologists, geographers, geneticists, social scientists, sociologists and more. We have a broad-based expertise on the genetic, population, species, ecosystem and landscape level, in terrestrial, freshwater and coastal marine ecosystems.

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Cooperation and expertise for a sustainable future