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# Performance standards and biodiversity no net loss commitments: An assessment of status and implementation gaps in Norway

Graciela Rusch, Lise Tingstad, Thomas Edward Sutcliffe and Ulrika Lein

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View of protected coastal area, Norway © Lise Tingstad

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# Abstract

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The importance of protecting biodiversity has been repeatedly highlighted in recent assessments and new international obligations related to the Kunming-Montreal Agreement, of which Norway is signatory. At the same time, new infrastructure development, including from the energy sector, increasingly puts pressure on Norwegian nature. An allocation of areas to renewable energy infrastructure implies a trade-off with other land-uses, hereunder nature conservation. These conflicting objectives places great demands on the processes for renewable energy development projects, and the private sector has an important role in making effective protection of nature an integral part of all planning and development of renewable energy.

Recently, considerable emphasis has been placed on goals of no net loss (NNL) of biodiversity, with the aim to revert trends of biodiversity and ecosystem functions loss. Norway's commitment to biodiversity conservation is anchored e.g., in the Global Biodiversity Framework (the Kunming-Montreal Agreement) (GBF), the white paper "Nature for life" ("Natur for livet") and the Nature Diversity Act. In addition, the Norwegian Environment Agency have recently reviewed the national guidelines of impact assessments (M-1941).

For the goals of NNL to be credible, the implementation should follow a systematic approach to quantify and manage impact. For this, the mitigation hierarchy is a widely applied tool to guide decisions about biodiversity in line with a goal of NNL. Hydro is one of many companies whose goal is to mitigate biodiversity loss through a NNL policy. To this aim, standards to help the private sector manage biodiversity impacts have been developed, among others, the IFC performance standard on "Biodiversity Conservation and Sustainable Management of Living Natural Resources" (PS 6), which have been specifically tailored toward the private sector operating in infrastructure development projects.

In this report, we first present an overview of concepts embedded in the mitigation hierarchy. In this context we review the concepts used to assess impacts on biodiversity, and mitigation and compensation measures, including the concepts of biodiversity no net loss and net gains. The principles of the mitigation hierarchy involve taking nature into account in all stages of a development process, from strategic and detailed planning to actual project implementation. At all stages of the project plan, it must first be assessed whether – and how – negative impacts on nature can be avoided, for example through alternative locations or by making changes in the project design This refers especially to biodiversity features of high conservation value in need of special protection. The next step is to minimize the negative impact by limiting the damage and repairing where possible within the project area. Finally, ecological compensation must be considered for remaining negative impacts, if NNL objectives are to be met. Ecological compensation means compensating for irreversible damage to nature caused by development projects by restoring, creating new habitats, or designating protected areas elsewhere than where the impact on nature takes place.

We then present how the mitigation hierarchy and NNL concepts have been operationalized in the IFC PS6 standard, and compare the criteria used with those in the recently updated guidelines for impact assessment on biodiversity produced by the Norwegian Environmental Agency (web-based report M-1914 2023). We also present an overview of the authorities with responsibility for nature management in Norway and the legislation that supports their areas of action. Specifically, we describe the roles of the national and local authorities making decisions on nature and the energy sector.

We further present an overview of methods and data sets that can be used to evaluate impacts, and which could support the implementation of no net loss policies in Norway. We highlight both the status of development, availability, as well as NNL policy implementation gaps.

It is critical that the knowledge base is up-to-date, and that high-quality ecological data are available for the particular area of interest for renewable energy development projects. Although Norwegian management authorities are working towards improving habitat mapping and indicators of ecological condition at project relevant scales, data at this level of resolution with national coverage will be in most cases incomplete. We refer to the guidelines in the M-1941 which indicate data sources and the methods to be used to collect missing data.

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# Sammendrag

Rusch, G. M., Tingstad, L., Sutcliffe, T. E. & Lein, U. 2024. Standarder og netto null tap (NNL) av biologisk mangfold: En vurdering av status og implementeringsmangler i Norge. NINARapport 2390. Norsk Institutt for naturforskning.

Norge er forpliktet gjennom blant annet Kunming-Montreal avtalen til å ta vare på natur. Samtidig øker presset på norsk natur i takt med utbygging av ny infrastruktur, blant annet i energi-sektoren. En allokering av arealer til infrastruktur for fornybar energi innebærer en avveining mot annen arealbruk, herunder også hensynet til natur. Disse interessekonfliktene stiller store krav til utbyggere av fornybar energi. Privat sektor har en viktig rolle i det å gjøre hensyn til natur og naturbevarende tiltak til en integrert del av all planlegging og utbygging.

Hydro har forpliktet seg til og har ambisjoner om å redusere tapet av biologisk mangfold; både gjennom IFC-standard "Biodiversity Conservation and Sustainable Management of Living Natural Resources" (PS 6), og gjennom ambisiøse mål i sin globale prosedyre. De ønsker å jobbe for en målsetting om «netto null tap» av biologisk mangfold (NNL) i nye prosjekter.

I denne rapporten gir vi først en grundig oversikt over begrepene som inngår i tiltakshierarkiet, et rammeverk for å veilede beslutninger om biologisk mangfold i utbyggingsprosesser. Vi går igjennom begrepene som brukes for å vurdere konsekvenser for biologisk mangfold, samt avbøtende og kompenserende tiltak, inkludert begrepene NNL og nettogevinst for biologisk mangfold. Prinsippene i tiltakshierarkiet innebærer at det tas hensyn til naturen i alle faser av prosessen, fra strategisk og detaljert planlegging til selve prosjektgjennomføringen. I alle stadier av prosjektet må det først vurderes om - og hvordan - negative konsekvenser for naturen kan unngås, for eksempel gjennom alternative lokaliseringer eller ved å gjøre endringer i prosjektutformingen Dette gjelder spesielt for biologisk mangfold med høy bevaringsverdi. Det neste trinnet er å minimere påvirkningen ved å begrense skadene og om mulig reparere negative påvirkninger innenfor prosjektområdet. Til slutt må det vurderes økologisk kompensasjon for de gjenværende negative konsekvensene, hvis målene om netto null tap skal nås. Økologisk kompensasjon innebærer å kompensere for irreversible skader på naturen forårsaket av utbyggingsprosjekter ved å restaurere, skape nye habitater eller utpeke verneområder andre steder enn der påvirkningen på naturen finner sted.

Deretter presenterer vi hvordan tiltakshierarkiet og konseptet NNL er operasjonalisert i IFC PS6-standarden, og sammenligner kriteriene som brukes med kriteriene i Miljødirektoratets nylig oppdaterte retningslinjer for konsekvensutredninger for biologisk mangfold (nettbasert rapport M-1914 2023). Vi gir også en oversikt over relevante lovverk som legger føringer for implementeringen. Vi beskriver spesielt rollene til nasjonale og lokale myndigheter som tar beslutninger om natur og energisektoren.

Vi presenterer også en oversikt over metoder og datasett som kan brukes til å evaluere konsekvenser og som kan støtte implementeringen av retningslinjer for NNL i Norge. Vi belyser både tilgjengelighet, utviklingsstatus og mangler i implementeringen av NNL-politikken. Det finnes per dags dato ingen operative nasjonale standarder for NNL og implementering av tiltakshierarkiet, men føringer legges gjennom både de nevne internasjonale standarder, og nasjonale lovverk og retningslinjer.

Det er avgjørende at kunnskapsgrunnlaget er oppdatert, og at data av høy kvalitet er tilgjengelig for det aktuelle området som er av interesse for utbyggingsprosjekter for fornybar energi. Selv om norske forvaltningsmyndigheter arbeider for å forbedre habitatkartlegging og indikatorer for økologisk tilstand, også på prosjektrelevant skala, vil data på dette oppløsningsnivået med nasjonal dekning i de fleste tilfeller være ufullstendige. Vi viser til retningslinjene i M-1941 som angir datakilder og metoder for innsamling av data

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# Contents

# Foreword

This report has been commissioned by Hydro Energy with the aim of presenting an overview of existing standards for guiding the evaluation of impacts on biodiversity, especially directed to the private sector and related to development projects in the energy sector. The focus has been the definition of core concepts within the mitigation hierarchy and no-net-loss-policies. We also propose a cross-walk between the criteria to assess impact of projects on biodiversity defined by the Norwegian Environment Agency guideline (NEA M-1941) and the International Finance Corporation Performance Standard 6 (IFC PS 6).

In addition to the report authors, several colleagues at the Norwegian Institute for Nature Research provided references and revised the text. We are especially thankful to Magni Olsen Kyrkjeeide, Astrid Skrindo, Kristin Tolstad Uggen, Dagmar Hagen, Signe Nybø, and Kristin E. Mathiesen for thoughtful comments on earlier versions of the report and for providing references.

22 April 2024
Lise Tingstad and Graciela M. Rusch

# 1 Introduction

## 1.1 Biodiversity loss and conservation goals

The world is facing a two-fold crisis; the climate change and the deterioration of nature (IPCC 2023; IPBES 2019). The two are closely interlinked; rapid climate change increases the pressure on biological systems, and the loss of well- functioning ecosystems makes nature less resilient. In the aftermath of the Paris Agreement, how to solve energy demands without increasing human induced greenhouse gas emissions (GHG) has been of high priority in signatory countries. The challenge of both transitioning to renewable energy sources while at the same time reaching the goals to halt biodiversity loss and ecosystem degradation has been highlighted as imperative (IPCC 2019, IPBES 2019).

In 2019, IPBES Global Assessment report gathered evidence at the global scale that the negative impacts on nature have dramatically accelerated in the past 50 years, leading to the loss of biodiversity and to loss of critical functions from which society depends on. The assessment showed that most of the biodiversity protection targets agreed on under the UN Convention on Biological Diversity (CBD) for the period 2011-2020 (the Aichi Targets), had not been achieved. The assessment also showed a degradation of most of the ecosystem regulating functions that were evaluated (regulating nature contributions to people). The biggest contributors to these challenges are i) changes in the use of land- and seascapes, ii) exploitation of animals and plant life, iii) climate change including extreme weather events leading to ecosystem loss and severe negative impacts on society, iv) pollution through chemicals and waste creating “dead zones”, and v) the spread of invasive species. The loss of biodiversity and ecological functions leads to the degradation of ‘the fabric of life’ (IPBES 2019, Díaz et. al. 2019). The Global Assessment report (IPBES 2019) called for the need of deeper transformations in how we manage and use nature: “Goals for conserving and sustainably using nature and achieving sustainability cannot be met by current trajectories, and goals for 2030 and beyond, may only be achieved through transformative changes across economic, social, political and technological factors” (IPBES 2019, p.6).

The transformations that IPBES called for, are today promoted by The Kunming-Montreal Global Biodiversity Framework (GBF) adopted during the CBD COP 15 meeting in December 2022. The agreement encompasses revised goals and targets for the period 2021-2030. The overall goal of the GBF is to halt the loss of biodiversity and promote a sustainable use of natural resources. It supports the Sustainable Development Goals (SDG’s), and in adopting the GBF, all Parties have committed to update their Biodiversity Strategies and Action Plans (BSAP), including revised national targets. In Norway, the GBF is known as the *Naturavtalen*, and Norway is currently revising its BSAP (the St Meld 14 Natur for livet[1]) that will submit to the next meeting of the parties in 2024 (COP16). This action plan is a white paper with a concrete roadmap on how to achieve these goals to be finalized in autumn 2024. The GBF encourages broad involvement from the whole society in the countries’ effort to achieve the goals, in line with the concept of transformative change.

The GBF also acknowledges the impact of climate change, and IPCC emphasizes the importance of an interdependence of climate change, sustainable ecosystems, halt the loss of biodiversity, and develop sustainable human societies and human well-being (IPCC 2023b). According to the international agreements and IPCC, Norway aims at becoming a low-emission society by 2050. The Norwegian 2050 Climate Change Committee released a NOU in 2023: The transition to low emissions – climate policy choices towards 2050”. This NOU has made a list of

[1] Det Kongelige Klima- og Miljødepartement. 2015. Melding til Stortinget 14 (2015-2016). Natur for livet. Norsk handlingsplan for naturmangfold. Det Kongelige Klima- og Miljødepartement.

recommendations to reach a goal of “reducing the emissions from Norwegian territory by 90 – 95 % compared to 1990” (NOU 2023).

In 2019, the European Commission presented the European Green Deal, which is EU’s response to tackling climate, environmental, and biodiversity-related challenges. It aims to transform the EU into a resource-efficient and competitive economy with no net emissions of greenhouse gases in 2050. Importantly, it aims to “… *protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment-related risks and impacts*.” (EU Green Deal, 2019: 2). As part of the Green Deal, the EU has a Biodiversity Strategy (2020-2030) that aims to put Europe’s biodiversity on a recovery path which also will meet the objectives of GBF and the United Nations SDGs.

Both the GBF and the EU Green Deal which include both new legislations (such as the EU Nature Restoration Law), and the revision of existing regulations (e.g. Directive 2013/34/ on sustainability reporting standards, with EEA relevance) provide context for national environmental policies in Norway. As mentioned earlier, the ongoing revision of Norwegian regulations aims to overcome gaps that currently fail to support both national biodiversity protection goals and follow up international commitments. Hence, given this international policy context, changes in the implementation of regulatory frameworks, including the definition of standards, are to be expected soon.

At the same time, Norway is experiencing an increasing expansion of the renewable energy sector, and in February 2023, a commission set up by the Ministry of Energy of Norway (ED) delivered a report called “Mer av alt – raskere (More of everything – faster; NOU 2023:3)”. The mandate of this committee was to suggest increased production of renewable energy to insure surplus energy in Norway towards 2030 and 2050 (NOU 23:3). At the same time, the Norwegian 2050 Climate Change Committee released another NOU in 2023: The transition to low emissions – climate policy choices towards 2050”. This NOU has made a list of recommendations to reach a goal of “reducing the emissions from Norwegian territory by 90 – 95 % compared to 1990” (NOU 2023). The recommendations in the NOU are in line with those of the IPCC most recent report (IPCC, 2023), where solar and wind power together with reduction of the conversion of natural ecosystems are the top three activities for scaling up climate action. However, renewable energy like solar and wind power plants on land undeniably use space. An allocation of area to such renewable energy infrastructure implies area and habitat fragmentation and loss, and degradation of habitat qualities. These are the most important drivers of biodiversity loss globally (IPBES 2019), and in Norway (NBIC 2018, 2021).

The conflicting objectives between the need for increased energy production and efficient nature conservation places great demands on the processes for renewable energy development projects. The Goal 15 of the GBF is about how industries and the private sector can contribute to reducing negative environmental impacts. This goal is aligned with European objectives and policies. The goal states that legal, administrative and policy measures should encourage and facilitate for the industries and transnational corporations to regularly “monitor, assess, and disclose their biodiversity risks and work to reduce the negative impacts on biodiversity and ensure sustainable production patterns”. A vision in the European Green Deal has been to involve the private sector to a larger extent so that it can contribute to achieve biodiversity and environmental goals.

## 1.2 Aims and content

This report aims to support the renewable energy sector in their endeavour to reduce negative impact on biodiversity. We start by presenting how the concept of “Biodiversity no-net-loss” is used today, and how Norway aims at following international agreements by developing national policies and management to fulfil the goals of reductions in carbon emissions and halting the loss of natural areas and biodiversity.

We provide an in-depth description of the mitigation hierarchy, which has been developed to guide activities that minimize the negative impact on nature and biodiversity. In light of the recent literature and Norwegian best practise, we describe how the mitigation hierarchy could be turned into a stronger tool to protect biodiversity by defining clearer criteria to apply at each step and by including quantitative assessments of impact. Secondly, we analyse the criteria of a frequently used performance standard used to account for impacts of infrastructure development projects on biodiversity in the light of Norwegian regulations and recently reviewed impact assessment guidelines.

# 2 The concepts of no net loss and the mitigation hierarchy

## 2.1 Biodiversity topics in sustainability reporting

In December 2023, the European Commission approved the Delegated Regulation (EU) 2023/2772, which supplemented the Directive 2013/34/EU regarding sustainability reporting standards. The new legislation is of EEA relevance.

For the purposes of the preparation of the legislation, the European Commission received technical advice from EFRAG[2] which fully prepared the draft of the EU Sustainability Reporting Standards (ESRS) and/or draft amendments to these standards. The regulation includes twelve ESRS, of which five, refer to the environment, i.e. (i) climate change, (ii) pollution, (iii) water and marine resources, (iv) biodiversity and ecosystems and (v) resource use and circular economy. We specify below the sub-topics and sub-sub-topics defined in the standards under the topic biodiversity and ecosystems (ESRS E4) (Table 2.1).

*Table 2.1. Sustainability matters covered in the topical EU Sustainability Reporting Standard E4 "Biodiversity and ecosystems" (ESRS E4). Source: European Commission 2023.*

| **Sub-topic** | **Sub-sub-topic** |
|---|---|
| Direct impact drivers on biodiversity loss | Climate change |
| | Land-use change, fresh water-use change and sea-use change |
| | Direct exploitation |
| | Invasive alien species |
| | Pollution |
| | Others |
| Impacts on the state of species | Examples:<br>Species population size<br>Species global extinction risk |
| Impacts on the extent and condition of ecosystems | Examples:<br>Land degradation<br>Desertification<br>Soil sealing |
| Impacts and dependencies on ecosystem services | |

The amended directive requires both reporting on specific sustainability topics as well as sufficient information that can enable the verification of the reported claims: "… *requires large undertakings, small and medium-sized undertakings with securities admitted to trading on the EU regulated markets, as well as parent undertakings of large groups, to include in a dedicated section of their management report or consolidated management report the information necessary to understand the undertaking's impacts on sustainability matters, and the information*

[2] https://www.efrag.org/About/Facts

[3] European Commission 2023. Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards. (Text with EEA relevance). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R2772.

*necessary to understand how sustainability matters affect the undertaking's development, performance and position. Undertakings are to prepare this information in accordance with sustainability reporting standards starting from the financial year indicated in Article 5(2) of Directive (EU) 2022/2464 for each category of undertakings"*.

In this context and based on the recognition that businesses' activities will have environmental impacts, companies need to set more targeted and measurable environmental goals, including that of biodiversity loss and ecosystem degradation. Regarding biodiversity related impacts such goals are increasingly being framed as 'No Net Loss' (NNL) or 'Net Positive Impact' (NPI) goals (Aima et al. 2015).

## 2.2 No Net Loss

While there is no universal definition, conceptually the NNL goal in development projects means that negative biodiversity impacts caused by the project, in terms of occupation of new areas, impact on species and their natural habitats, should be balanced by biodiversity gains through compensation measures. We present the definitions proposed by the International Union for Conservation of Nature (IUCN) as formulated in Aima et al. (2015).

"*From a conservation perspective, achieving an NNL goal for a given project ultimately means no net reduction in the:*
• *diversity within and among species and vegetation types;*
• *long–term viability of species and vegetation types; and,*
• *functioning of species assemblages and ecosystems, including ecological and evolutionary processes*"

Norway has formulated three national goals for biodiversity protection that are very much aligned with the international formulation:
– achieving good ecological status in ecosystems
– safeguarding threatened species and habitats
– maintaining a representative selection of Norwegian nature (the conservation of areas covering the whole range of habitats and ecosystems) (Meld. St. 14 (2015-2016) Norway's Biodiversity Strategy and Action Plan).

Following the commitments in the Convention on Biological Diversity (CBD) for the period 2011-2020 (the Aichi Targets), and the encouragement to formulate national biodiversity strategies and action plans (BSAP), the Norwegian Government formulated its biodiversity protection aims in the Meld St. 14 (2015-2016). However, Norway has not yet finalized the update of national targets following the new CBD agreement (2021-2030), the Global Biodiversity Framework or Kunming-Montreal Agreement (*Naturavtalen* in Norwegian). During 2024, the Norwegian government plans to develop a White paper on nature and biodiversity according to the GBF as well as one on climate for the period up to 2035 on the road to become a low-emission society in 2050. Until the new plan is finished, the national goals formulated in the Meld.St.14 2015-2016, following the commitments for the 2011-2020 period of the Convention on Biological Diversity (CBD), the Aichi Targets, are valid.

There is no agreed, normative national definition of NNL in Norway, although this could have been developed together with a set of guidelines which operationalized the concept in different situations of impact assessment and compensation contexts when formulating the BSAP back in 2015.

Impact assessments in the renewable energy sector, for this report represented by Hydro, needs to comply with the Norwegian legislation as mentioned above. Hydro also has further formulated corporate defined goals stated in their Global Procedure, i.e. to achieve "*no net loss of priority biodiversity in new projects and major changes to existing operations*", in line with the IFC PS6, a voluntary standard developed by the International Finance Corporation (IFC) to report on corporate risks related to biodiversity and nature (IFC PS6 "Biodiversity Conservation and

sustainable management of living natural resources" (IFC, 2019)). Hydro's Global Procedure further states that *"all Hydro owned or operated companies, and other applicable legal entities, shall conduct an assessment to identify potential risks related to biodiversity and ecosystem services, within the operations' area of influence. This assessment shall also identify and describe any priority biodiversity features".*

Further, this calls for an operational definition of "critical habitats" and "priority features for biodiversity conservation", and what to include under "area of influence". As indicated in the IFC PS6, priority biodiversity features will vary according to the national regulations and conservation priorities. In the Norwegian context, the Environment Agency's manual M-1941 provides a detailed description of how to classify the degree of impact on biodiversity features, including a scoring scale of the degree of conservation importance of the feature or habitat (see Verditabellen 2.4 Sett verdi - Miljødirektoratet (miljodirektoratet.no)). In the guidelines, there is no use of the terms "critical habitats" and "priority biodiversity features", but both habitats and features of particular conservation importance are specified in the national BSAP (Meld St 14 2015-2016), and Norway has regularly updated Red-lists of both habitats (NBIC 2018) and species (NBIC 2021). Details on priority biodiversity features, and an alignment of the international standards and the equivalences in the Norwegian management system, is presented in Chapter 3 (but see also chapter 5 and Table 5.1).

Regarding the delineation of the area of influence, the M-1941 guideline describes in detail how the area where the project is planned to be developed should be described and mapped[4]. The first step is to delineate the area and distinguish sub-areas (delområder) that are homogeneous in terms of their function, character, and conservation value. The total impact on the project influence area is calculated as the sum of the impact scores for each sub-area: "Assess the overall impact within the area of influence. Assess how the sum of the impact from all sub-areas interacts with the effects of other impact factors within the area of influence. The requirement to assess the cumulative impact is found in §10 of the Nature Diversity Act.

The guideline also describes how possible impacts beyond the influence area of the project (the actual area occupied by the project and the area affected during the construction phase) should be assessed, i.e.:

- **Edge effects: "**Edge effects are defined as changes in ecological processes caused by interventions or activities that occur in the vicinity of the project area". Area take or the degradation of areas can affect biodiversity outside the area being encroached upon. Edge effects can be, for example: increased runoff, drainage of wetlands and reduced habitat area. The impact assessment should evaluate which edge effects may occur by looking at the area as a whole.
- **Fragmentation of habitats and their connectivity**: "…assess whether the plan or measure splits or reduces the ecological infrastructure in the landscape or prevents the exchange of individuals/genes between ecological functional areas." "As far as possible, it should also be assessed whether fragmentation affects the vulnerability of species living within the area as a result of the reduction or loss of corridors that connect these areas and ensure the possibility of movement".

Hence, defining the area of influence for a given site will have to be part of the habitat and biodiversity features assessments and involve experts with competence to evaluate the impacts.

## 2.3 The mitigation hierarchy

For the overall goals of NNL to be credible, the implementation of NNL policies should follow a systematic approach to quantify and manage impact. Arlidge et al. (2018) propose that the mitigation hierarchy can provide such an integrated framework that enables the quantification and

[4] https://www.miljodirektoratet.no/ansvarsomrader/overvaking-arealplanlegging/arealplanlegging/konsekvensutredninger/metode-for-utredning/naturmangfold/1.5-vurder-pavirkning

subsequent reduction of human impact on biodiversity, by putting together all aspects of conservation under a standardized accounting system with a broad biodiversity conservation goal, and that can support multiscale, evidence-based decision-making.

The mitigation hierarchy is widely used by various sectors worldwide and in Norway[5], and standards and practices associated to the different action-steps have been under revision (see also status in Chapter 3). The hierarchy is designed to address impacts on biodiversity and ecosystem services through four steps designed to be implemented sequentially: 1) avoid, 2) minimize, 3) remediate, and 4) offset (Bull et al. 2016) (Figure 2.1).

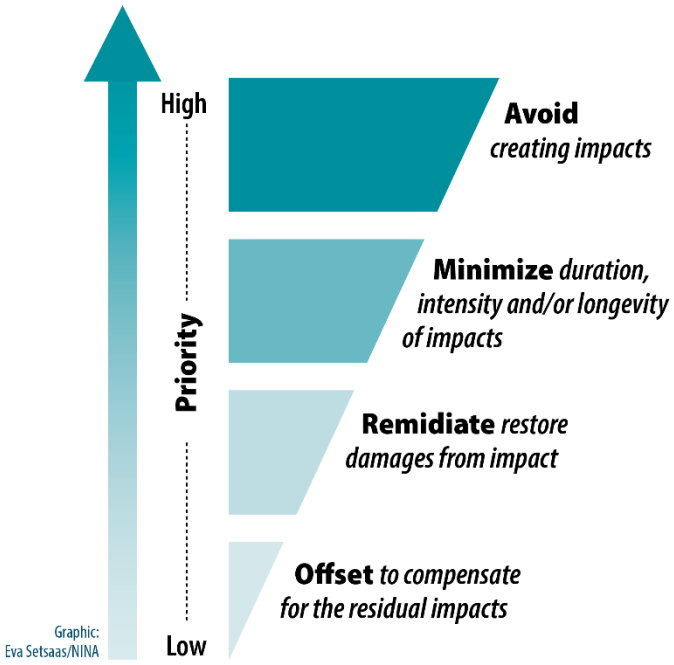


*Figure 2.1: Schematic figure of the mitigation hierarchy with the four consecutive steps. Modified from Norwegian Environment Agency (www.miljodirektoratet.no). The most important actions are those that avoid damage on biodiversity. Offsetting should be used to compensate for the total remaining impacts.*

The classical representation of the mitigation hierarchy is through the step-by-step diagram as pictured in Figure 2.2. The staples represent the different steps of the hierarchy and associated actions. The four consecutive steps are shown using the terminology for the steps *sensu* Bull et al. (2016). Avoid impact (A), minimize impact (M), restore on-site impacts through remediation actions (R). The remaining impact is what requires compensation or offsetting actions (O) in order to fulfil NNL or nature positive action (Figure 2.2). Each step of the hierarchy will be discussed in detail below.

[5] https://www.vegvesen.no/fag/fokusomrader/klima-miljo-og-omgivelser/naturmangfold/verktoy-for-a-unnga-eller-begrense-skade/

As for NNL in general, there are some inconsistencies in the mitigation hierarchy, often related to linguistics and definition of terms (Bull et al 2016). It is therefore important to, whenever applying terms of the hierarchy, to use clear definitions, adapted to the relevant scale. In this report, we use the definitions in Bull et al. (2016). One common confusion is whether an action is an avoidance or minimization measure. To distinguish between these two, it has been suggested that an avoidance measure is one which determines that biodiversity features should not be impacted by the project, and therefore will require no further action to eliminate impact (Fig. 2.2 and 2.3). Minimization measures on the other hand require specific action (for instance careful planning of operations) so that the impacts are reduced to the minimum possible (Bull et al 2016). Both are preventive actions, whereas remediation and offsetting are compensatory actions. Still, all four steps of the hierarchy may be applied throughout a project's lifespan. Measures to avoid or minimize are not limited to the planning phase or the construction phase but may also be implemented throughout the project's lifespan.

There is likely an expected higher chance in achieving NNL if the three first steps in the mitigation hierarchy are adequately applied (Gardner et. al. 2013). To improve transparency, accountability, and conservation effectiveness, setting evidence-based standards for each of the steps should be a priority. Further, the chances of success are better in an area that is already modified or degraded nature, as compared to areas of a more pristine character.

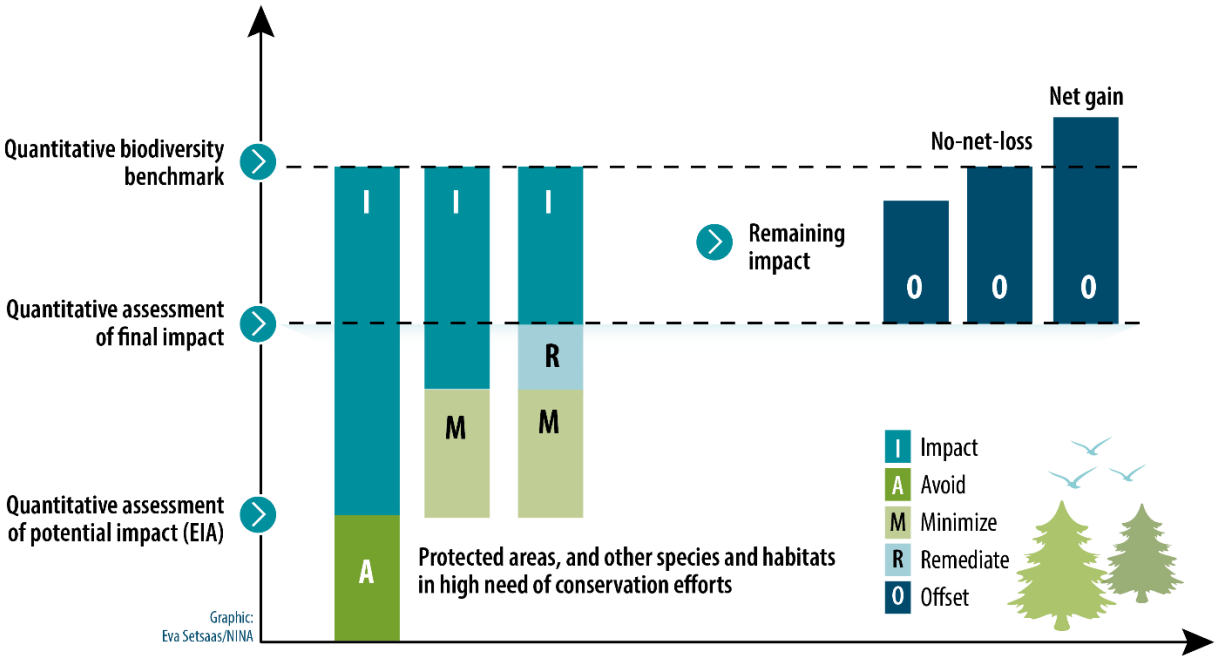


*Figure 2.2. Steps in the mitigation hierarchy embedded in an assessment of impacts on biodiversity. I: Impact (including an assessment of the cumulative impact); A: Avoid; M: Minimize; R: Remediate; O: Offset; NNL: No-net-loss. Adapted from IUCN 2012.*

To operationalize the mitigation hierarchy, it is necessary to establish objective, clearly defined criteria to assess impact and the level of compensation that will be required. Metrics and standards should define the condition of biodiversity features before and after the development of the project (for each step in the mitigation hierarchy), as well as the condition of biodiversity features before and after the offsetting actions (Fig. 2.2). The rest of this chapter describes the steps in the mitigation hierarchy and in Chapter 3 we present the guidelines prepared by the Norwegian Environment Agency (NEA) for the assessment of impacts of plans and projects on biodiversity (NEA M-1941).

### 2.3.1 Avoidance (Norwegian "unngå")

Arguably the most important step of the mitigation hierarchy is impact *avoidance*. This requires developers to predict and prevent negative impacts on biodiversity prior to any development actions taking place (Business and Biodiversity Offsetting Programme (BBOP) 2012). This includes screening for potential risks of biodiversity loss early on at the project design stage and identification of alternate development sites (Phalan et al. 2017) (Fig. 2.3). Identification of already degraded areas (often called "grey areas") as alternative locations is an increasingly preferred option to avoid impact on natural areas. Avoiding impact is the most certain and effective way of avoiding harm to biodiversity, and it is the first stage to implement in any project following the mitigation hierarchy (Phalan et al. 2017). For actors following the IFC PS6 standards, this step is clearly stated as a matter of priority:" *the client should seek to avoid impacts on biodiversity and ecosystem services"* (IFC PS6).

To be effective, *avoidance* must be implemented as early as possible in project planning, before actions or decisions that could lead to negative impacts are taken, at a point where adjustments are still feasible (BBOP 2012). An avoidance measure requires no further action to eliminate the corresponding impacts (Phalan et al 2017).

*Avoidance* may also offer additional benefits. In principle, impact avoidance will reduce the magnitude of the offsetting needs, thus side-stepping problems such as restoration time lags, limits to what can be offset, and negative social implications (Norwegian Environment Agency 2023). In addition, the costs are known up-front, are not ongoing, and the measure takes place within a short and predictable timeframe. All these benefits make *avoidance* a cost-effective step of the hierarchy, and often presents a chance of success regarding NNL and potentially net gains of biodiversity (Ekstrom et al. 2015).

In practice however, there are concerns that impact avoidance is often overlooked, misunderstood, or poorly applied by developers (Clare et al. 2011, Villarroya et al. 2014). It may be related to gaps in the regulations, lack of specific targets embedded in an integral framework to achieve halting biodiversity loss or neglecting the step in early planning. It may also be challenges in choosing areas that are relevant for renewable energy as e.g. wind energy power plants or solar energy have certain requirements for e.g. windy areas or areas with open solar radiation.

Choosing between alternative locations or changing the design of the project to avoid negative environmental impact is challenging and must be weighed against other benefits. These overarching challenges of trade-offs in land-use have yet to be solved, and call for innovative research, new data, and include the development of operational frameworks such as project-based ecosystem accounting. This is one of the most significant topics in the proposed research centre "FME Areal" (2025-2032 if funded by the Research Council), involving a wide range of partners from research, the industry, and management authorities.

### 2.3.2 Minimize (Norwegian: "begrense")

When the project is undertaken, the relevant step of the mitigation hierarchy is minimization (Fig. 2.1). The Cross-sector Biodiversity Initiative (CSBI) has defined minimization as "*measures taken to reduce the duration, intensity, significance and/or extent of impacts (including direct, indirect, and cumulative impacts)*. This typically includes on-site measures that can occur adaptively throughout the project's lifespan, from planning and design to construction, operations, and

end-of-life activities (Ekstrom et al. 2015, for a detailed example of planning design as a mitigation measure, see Appendix V). Measures will also vary according to characteristics of the project site and type of infrastructure to be developed. For instance, impacts can be minimized through adjustments of the timing or sequencing of development activities, and the use of alternative technologies or materials that are less damaging.

There are good examples in Norway of measures that aim at minimizing the impact of construction activities, both within the renewable sector and elsewhere, and these experiences can be applied across sectors. Many different measures can be applied for the minimization, including direct actions on the sites, such as reuse of topsoil (e.g. Hagen & Olsen 2021, Skrindo 2008, Kyrkjeeide et al. 2023), preparation for vegetation recovery (Hagen et al. 2023, Rydgren et al. 2013, Mehlhoop et al. 2018), establishment of habitats in regulated rivers (Forseth et al. 2013). Other measures can be the training of project staff, entrepreneurs, and machine drivers (Hagen et al. 2021) or regulate timing of activity in the field to avoid disturbing wildlife in particularly vulnerable periods of the year (Moe et al. 2021).

In general, these actions are closely related to terms and conditions set in the given permission, and these will vary between projects. Construction in protected areas will typically expect more strict conditions, such as the case for hydropower upgrading in Landscape protected areas (as Trollheimen; Hagen 2012, or Knudshø, Kyrkjeeide et al. 2023). When establishing a new Geodetic Earth Observatory in Ny-Ålesund, Svalbard, the projects owner (Norwegian Mapping Authority) perceived the terms and conditions from the Governor as very strict, but during the course of the project the Mapping Authority took ownership of the project and used the mitigations of environmental impacts as part of an environmentally friendly image of the Geodetic Earth Observatory; a strategy with great impact both within the project organization and a contribution to improvement of their relationship with local authorities towards authorities and partners (Hagen & Olsen 2021).

### 2.3.3 Remediate (Norwegian “Istandsette” eller “restaurere”)

Any construction activity in natural areas has negative impacts on nature values (Hagen & Olsen 2021). The third step of the hierarchy relates to reversing impacts caused by the development on the project area. This stage of the mitigation hierarchy is understood as reversing damages from the infrastructure establishment phase, i.e. improving the ecological conditions compared to how the impact would be without such measures. In the best of scenarios, remediation/restoration can be a mechanism to balance impacts and get closer to achievement of targets such as NNL (Fig. 2.2). Best practices developed in the field of restoration ecology should guide restoration actions (Hagen & Erikstad 2023). If the development activity is located in already degraded sites (“grey areas”), then restoration measures might contribute to improve ecosystem condition within the construction area towards NNL and even attain biodiversity gains.

Some of the techniques used for restoration/remediation can be similar to those described to minimize impacts, with a long-term goal to improve the ecological condition and prepare for natural processes to unfold (see e.g. Erikstad et al. 2023, Hagen et al. 2022b). Categories of measures for restoration will be such as: landscaping, soil and/or nutrient content improvement, seeding or planting to promote faster recovery of a vegetation cover, reintroduction of species, or removing introduced species (Aradottir & Hagen 2013). Like for the minimization step, training of the involved personnel, for instance through applying the “Green training strategy” have proven useful at all stages of projects; planning, construction, operation, and decommissioning (Hagen & Erikstad 2023, Erikstad et al. 2023). All these measures are relevant and have been applied in the renewable energy sector, especially related to maintaining elements of the vegetation (such as old plants), but also for the restoration of temporary infrastructure in new power plant or power line construction. In the future, as licences of first-generation onshore wind power plants expire, restoration measures can be used in decommissioning (Oslo Economics AS & Sweco Norge AS 2021). One general challenge in using restoration measures to mitigate impact is the lack of documentation, evaluation, and monitoring to measure or evaluate positive effects. This is an overall problem in restoration practice which hampers the development of cost efficient

and high-quality restoration (Evju et al. 2021, Nilsson et al. 2015). Another challenge is the matter of time, as ecosystem attributes, functions and structures develop over time, and the true effect of restoration measures will not always be observed during the typical lifespan of, for instance a renewable energy project.

### 2.3.4 Offsets (Norwegian "kompensasjon")

The last step of the mitigation hierarchy is commonly known as offsetting to compensate for the residual impact not captured by the first three steps of the hierarchy (Alridge, 2018, Fig. 2.2). This is where the total impact from a development project is compensated for, and the final step to outweigh negative impact on biodiversity and potentially reach the goal of no net loss or even a biodiversity gain. Policy standards for biodiversity offsetting diverge across national and international policies, and depends on aspects like governance, data availability, ecological understanding, and ecological status. Three kinds of measures are commonly used and have also been applied in pilots for compensation in Norway: 1. restoration of degraded areas, 2. creation of a new habitat, or 3. protection or conservation to secure areas with existing nature qualities. This gives several opportunities for offsetting as the different types can be combined, but at the same time, there are legal, economic, and ecological barriers for its effective implementation in different countries. Many countries around the world have implemented ecological compensation according to the guidelines and criteria developed by BBOP (2017). New opportunities for establishing indirect offsetting mechanisms could arise from, for instance, restoration targets under the GBF and regulatory frameworks such as the European Nature Restoration Law[6] which aims to broadly address habitat degradation.

In many European countries, offsetting and compensation is understood in relation to the mitigation hierarchy, and only applies as a last resort (Droste, 2022). In Norway, compensation became a legal measure when the new Nature Diversity Act came in 2009. §48 states that compensation can be required if a development project causes negative impact on a protected area, a *selected habitat type*, and/or a *priority species* with specific ecological functions (Lundstein & Haaland 2017). The use of compensation in development projects related to the Planning and Building Act has been investigated, and in 2019 the Government formulated principles for compensation (the guidelines have been made public[7], but so far have not been published (see also Hagen et al 2022)). These principles are based on the experiences from the investigation and pilot studies explored within the Transport Sector and do not currently apply to the Energy sector but can still be adopted. Developers may also decide on voluntary compensation through private agreements, as for example the company Sira-Kvina did when upgrading a large hydropower dam and constructed new wetland in the gravel pit following construction[1].

Since the introduction of compensating and offsetting regulations happened almost 50 years ago, recent studies question the effects of the policy measure (Borges-Matos, Maron & Metzger, 2023) and report on low success rates in achieving NNL (Zu Ermgassen, 2019 a). Key challenges for achieving NNL with compensation and offsetting relate to the definition of 1) equivalency, the like-for-like approach, 2) the location of the offset site, 3) the assessment of additionality, 4) timing, 5) offset duration and compliance, and 6) "currency" (McKenney and Kiesecker 2010). Currency is referred to as the ecological elements that will be traded in an offset process and how these elements are numerically compared (Borges-Matos et al 2023).

The pilot projects from the Transport Sector have shown difficulties in finding available areas for compensation (Hårklau et al 2019). The Energy Sector will most likely also face this challenge if compensation should be an option in future development of renewable energy. At present the

[1] (https://storymaps.arcgis.com/stories/3e6013b0d4864fdf95edf8bb46511428 ).
[7] vedlegg-5---prinsipper-for-bruk-av-okologisk-kompensasjon---regjeringen-2019.pdf (statsforvalteren.no)

Energy Directorate has no authority to claim land for compensation outside a concession area. Power plants potentially occupy large areas, and with a given compensation ratio (see below) there will be need to acquire huge areas from (private and public) landowners. Also, according to the Plan and Building Act, expropriation of properties for restoration of degraded land is not permitted. There is also variation in how much the impact is being compensated in the international offsetting literature (between 1:1 – 30:1). This aspect of offsetting can also be labelled as 'multipliers' and refers to "*the relative quantity of biodiversity gains at offset and impact sites, or the relative areas over which the impact and the offset actions are undertaken*" (Bull et al, 2016). The Norwegian Transport sector has applied the ratio 1: 3 (see example on Åkersvika, Appendix V), where 1 ha of nature type lost has been replaced with 3 ha of the same nature type. zu Ermgassen et al (2019) identifies that key reason for the success of a biodiversity offset strategy appears to be high offset ratios.

Using protection of intact nature as a compensation/offset strategy has met critique, as changing the conservation status of an area (the level of formal protection), will not automatically result in enhanced conditions for the survival of biodiversity relative to the pre-compensation/offsetting status (Simmonds, 2020, Damiens et al. 2021).

In the case of IFC PS6, the requirements for offsetting are described as: "*For the protection and conservation of biodiversity, the mitigation hierarchy includes biodiversity offsets, which may be considered only after appropriate avoidance, minimization, and restoration measures have been applied"*. A biodiversity offset should be designed and implemented to achieve measurable conservation outcomes that can reasonably be expected to result in NNL and preferably a net gain of biodiversity; however, a net gain is required in critical habitats (for details on critical habitat, see Chapter 4, Table 4.1). The design of a biodiversity offset must adhere to the "like-for-like or better" principle and must be carried out in alignment with best available information and current practices. When a client is considering the development of an offset as part of the mitigation strategy, external experts with knowledge in offset design and implementation must be involved. These requirements need clear impact assessments and compensation protocols to be operational, including a definition of what to avoid, how to evaluate the likelihood to achieve measurable conservation outcomes, and how to measure NNL and net gain. Therefore, better understanding the mitigation hierarchy as a framework to achieve NNL in a broad sense (Hagen et al. 2022a) is important for successful implementation.

The NEA M-1941 also refers to the mitigation hierarchy, including offsetting, but there are no clear criteria to guide decisions about how impacts should be compensated (offset). It is clear though, that offsetting as currently implemented in Norway, is not directed to support biodiversity NNL or net gain objectives directly. However, the semi-quantitative method to assess impacts described in NEA M-1941, could be developed in the future into a standard that includes clearly defined compensation criteria and rules.

The challenge of offset duration correlates to the responsibility of ensuring the full cost of repairing the damage that is caused. The long-term retention of offset gain should be covered for the management and monitoring costs, according to best practice guidelines (Damiens et al., 2021). Best practice would also relate to covering for the governance cost and additional resources for controls, research, and stewardship that an offsetting measure would require (ibid). If conservation or protection is applied as a mitigation measure in Norway, the legal responsibility will fall on the environmental authorities. To avoid the risk of diverting resources away from conservation, providing investments that are additional to current conservation entails supporting the existing capacities of the state and civil society (Ibid).

# 3 The Norwegian nature management system

## 3.1 The overall structure

The Norwegian nature is managed through regulations applying at different levels of governance. The Nature Diversity Act (Naturmangfoldloven, NML) is under the responsibility of the Ministry of Climate and Environment, while the implementation of the Planning and Building Act (Plan og bygningsloven (PBL).) is under the responsibility of the Ministry of Local Government and Regional Development. Both pieces of legislation are sector-wide (www.lovdata.no). Area and land-use allocation outside conservation areas is implemented in municipal plans and governed by the PBL. However, license to develop fossil or renewable energy projects including establishment of power lines, hydro-, solar- or wind power is regulated by the Ministry of Energy through the Energy Act. In 2023 new legislation was adopted stating that license for on-shore wind-power requires municipal approval, in line with the regulations in the PBL.

The Energy Law (§2) links to the PBL for the preparation of environmental impact assessment to support any application for license.

The Natural Diversity Act regulates all types of protection and sustainable use of Norwegian nature, and divides nature into three main categories, and five value categories from areas with negligible biodiversity value to areas with very high biodiversity value (Figure 3.1, Table 4.1).

The three main categories are:

- All nature (management goals and environmental regulations)
- Nature that requires special considerations (selected habitat types, ecological function areas for prioritized species)
- The most valuable nature (priority species, protected areas)

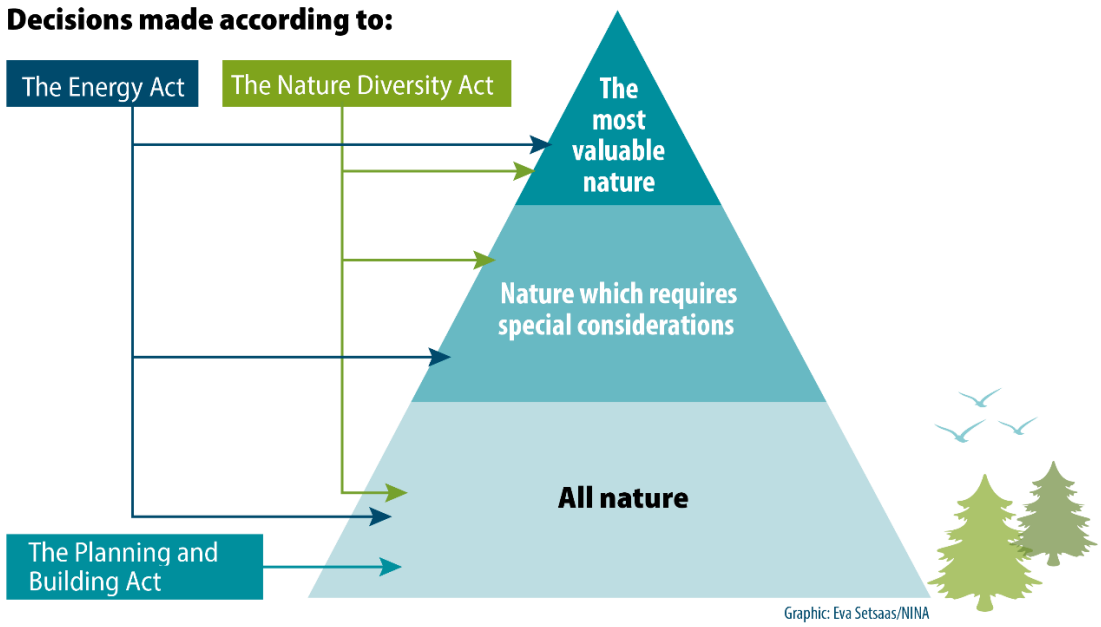


*Figure 3.1: The management of the Norwegian nature is regulated by different laws at different levels. The Nature Diversity Act demands that all plans and decisions founded on the Planning and Building Act which impact nature must take cumulative impacts into account. However, the evaluation of the total burden is based on impact assessments (konsekvensutredninger; KU).*

Renewable energy projects are regulated at the national level, where the energy developer (e.g. Hydro) must apply for a license (konsesjon) from the Norwegian Directorate of Water Resources and Energy (NVE; Figure 3.2). As energy development is a national responsibility, the Energy Act and the Nature Diversity Act are the applicable legislations, while the Planning and Building Act set the requirements for the impact assessment at the project level (Regulations of Impact Assessments 2017, Figure 3.2).

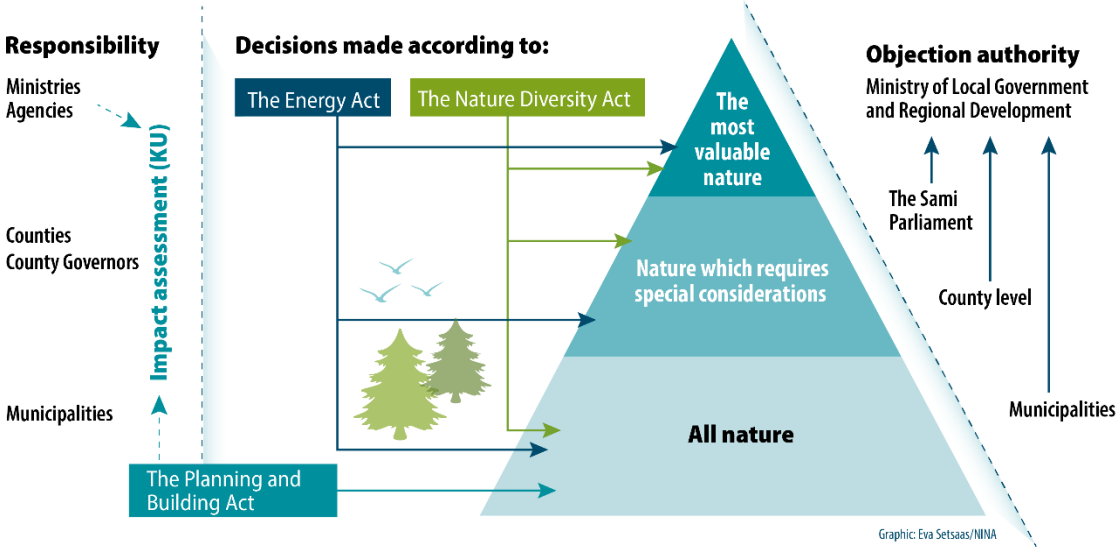


*Figure 3.2 Renewable energy projects require a license from NVE, but also need to conduct an impact assessment according to the Planning and Building Act.*

In Norway, a general requirement for impact assessments for major developments of all kinds was introduced in the pbl from 1990. Impact assessments have been subject to regular revisions and constant improvement, and still function as the most central knowledge base when it comes to licensing or rejection of energy development projects (NVE 2010, NVE 2022a, NVE 2022b, Norwegian Environment Agency 2023).

Objections (innsigelser) comes to play when developing plans or regulation proposals affect issues of national or significant regional importance (nasjonal eller vesentlig regional interesse), or which for other reasons are significant to the relevant body's area of responsibility or assessed to have specific negative effects on the environmental values in question. There is a higher threshold to object plans that are considered to have significant social value.

Municipalities, affected state, regional bodies, and the Sami Parliament can all submit objections, (Figure 3.2). Municipalities may submit objections to proposals on issues of significant importance to the municipality's residents, to business and industry, or the natural or cultural environment (See more at Planning and building Act e.g. § 5-4, § 11-16 og § 12-13). Affected state or regional bodies (e.g. County Governor) can submit objections to the municipal plan, and the Sami Parliament may submit objections on issues that are important to Sami culture or business practice (see more at: www.regjeringen.no Rundskriv Nr: T-2/16 av 17.02.2021; The Sami Parliament's planning guide, www.samediggi.no). When an objection is raised, the final and legally binding planning decision is transferred to the Ministry of Local Government and Regional Development (Figure 3.2).

## 3.2 How legislation affects renewable energy development

Renewable energy like offshore wind or sun power are a relatively new legal subject area, and therefore may lack clarifications in how the Energy Act or the Marine Energy Act (valid for areas more than 12 nautical miles off the coastline) interact with the Nature Diversity Act (Tellemann 2022). The significance of legal acts is revealed through examinations of legal issues related to e.g., the impact assessments, through legal proceedings/court cases, or through “common practice” in the management.

While developing of any energy power plant must provide the "energy supply, environment, safety, commercial activities and other interests" according to the Marine Energy Ac, § 1-1), the Nature Diversity Act only apply "as far as appropriate" (“så langt det passer”), § 2-3 in areas outside 12 nautical miles. The offshore wind licensing process consists of three main steps: the impact assessments, opening decisions and licensing decisions (Tellemann 2022).

To better explain how this works, we include an example from the opening of the Offshore wind area Southern North Sea II (Tellemann 2022). In this case, the Ministry of Energy commissioned a project-specific impact assessment particularly on seabirds, fish, marine mammals, seabed communities, as well as overall environmental risks. The Southern North Sea II area appeared to coincide with the spawning area of sand eel (Tobis in Norwegian; *Ammodytes marinus*), but there were no specifications how spawning areas should be taken into account in a project-specific impact assessment. Because the sand eel has an important function in the North Sea ecosystem, the Ministry decided to avoid these spawning areas for energy development and took these areas out of the announcement areas. This means that the project-specific impact assessment did not include spawning areas for sand eel, and it became less relevant to include sand eel spawning areas as one of the vulnerable habitats in the impact assessment (Tellemann 2022). The conflict was then resolved early in the process and before licenses were released.

Even if an area is open for offshore wind, there are good opportunities to take the environment into account even before a project-specific impact assessment is carried out. This opens up for the best use of the Nature Diversity Act, as the avoidance process can be looked at as an ecosystem conservation that associate with the Act. An area with the status “the most valued nature” (Fig. 3.1), does not exclude other activities, but signals the importance of being precautious. As the Ministry emphasized, the importance of conserving specific nature through project-specific impact assessments, so may the renewable energy industry use the “precautionary principle”.

# 4 Standards to implement NNL strategies

Here we present a description of selected standards directed towards the private sector. We have focused on large infrastructure development projects, including those in the energy sector, that aim at minimizing and compensating for impacts on biodiversity underpinned by the concepts in the mitigation hierarchy. We compare the criteria in the standards with how the criteria for impact assessment on biodiversity have been developed in Norway.

## 4.1 Performance standards in policy mixes

In the past decade, the importance of policy mixes for biodiversity and ecosystem services protection that are complementary, synergistic, and aligned to achieve a common goal, has been recurrently highlighted (Barton et al. 2009, Ring & Schröter-Schlaack 2011, Barton et al. 2017, IPBES 2019, Visseren-Hamakers 2022). The main messages distilling from this work is that to be effective, a series of policy instruments need to be designed in a way that consistently support each other. Bernasconi et al 2016, for instance show how regulatory instruments such as the Forest Law in Brazil, underlie the design of economic instruments such as Tradable Development Rights (TDR), which has elements of impact assessment and compensation measures.

Sparked by ambitious environmental goals, there are several ongoing initiatives aiming to develop standards that can guide the engagement of the private sector to contribute to achieving recently revised environmental targets. We focus primarily on the performance standard PS 6 developed by the IFC. However, there are currently few environmental standards directed to the private sector, that address specifically biodiversity conservation goals. Ongoing efforts include the development of the EU Taxonomy (biodiversity), the Corporate Sustainability Reporting Directive (CSRD) by the European Commission, Taskforce on Nature-related Financial Disclosures (TNFD) and the International Finance Corporation (IFC). The reporting standards in European Sustainability Reporting Standards (ESRS) is based on TNFD and the EU Taxonomy. ESRS consists of several standards, where ESRS E4 concerns biodiversity and ecosystems. In this report, we focus mainly on the IFC standard because this is the one that is currently most aligned with Hydro's operationalization of a biodiversity NNL strategy. However, any standard will have particular requirements and use specific criteria to be operational, and it is unlikely that all standards will correspond fully on to each other. We include a brief description of the EU taxonomy, the ESRS, and the TNFD standards in Appendix III.

With the notion of policy mixes, we understand Performance Standards in this report as a policy instrument, aimed at contributing to achieve biodiversity conservation objectives, directed to the private sector, and embedded within national and international policies. Accordingly, one main objective of this report has been to interpret and code the IFC Environmental and Social Responsibility Standards, with specific focus on biodiversity conservation goals, as embedded in the Norwegian policy context. Our aim was to map as far as possible, the requirements of the international standard to the Norwegian conditions, given the level of advancement in national regulations and standards development in the country. We also identify areas where the IFC standard and the implementation of Norwegian regulations do not fully correspond and identify gaps both in the IFC PS6 standard and in the Norwegian implementation of regulations that can form barriers to achieve more ambitious biodiversity conservation goals as those formulated in the Kunming-Montreal Global Biodiversity Framework (GBF, CBD 15), and in the EU Green Deal (EU Biodiversity Strategy 2030).

## 4.2 The IFC Performance Standard 6

IFC Environmental and Social Performance Standards define a minimum level of requirements for an investment in eight areas of environmental and social responsibility. Based on the harmonized guidelines of the European Development Finance Institutions (EDFI), they are the standard for all high and medium risk (A-B) projects. For low-risk (C) projects, the minimum level is set by local legislation (https://www.edfi.eu/policy/).

Accordingly, IFC has established eight Performance Standards that companies are to meet throughout the life of an investment financed by IFC. Performance Standard 6 (PS6) refers to "Biodiversity Conservation and Sustainable Management of Living Natural Resources".

IFC PS6 has the following general objectives:

i. To protect and conserve biodiversity.
ii. To maintain the benefits from ecosystem services.
iii. To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

IFC PS6 defines three broad **types of habitats** (Modified Habitats, Natural Habitats and Critical Habitats). Modified, natural, and critical habitat refer to the biodiversity value of the area as determined by species, ecosystems, and ecological processes. It is stated that these three habitat types should be mapped in the landscape of the project's area of influence to inform the applicability of PS6.

Modified, natural, and critical habitats are defined in the PS6 (here presented in Table 4.1), and there are related criteria and threshold for the assignment to either one of the three habitat types. The IFC PS6 and the associated guidance notes also acknowledges that there "*is no universally accepted or automatic formula for making determinations on critical habitat*" (IFC, 2019). At the same time, the IFC PS6 standard repeatedly stresses that national regulations and their operationalization must guide the impact assessment and eventually decisions on compensation. In Norway, the Norwegian Environment Agency guidelines for impact assessment were revised and published in October 2023 (M-1941, NEA 2023). It aligns closely with the general requirement of IFC PS6 in the sense that it indicates step by step how to assess the *remaining impacts* (after impact avoidance and minimizing measures have been implemented) of a project on biodiversity, and to a limited extent on ecosystem services. The guideline follows Norwegian regulations and provides a semi-quantitative method for the appraisal of impact. Both the IFC PS6 and the NEA guidelines stress the importance of engaging qualified experts for making the assessment of impacts, especially because data available are often limited.

The Norwegian guidelines do not define 'critical or natural habitats', or 'priority biodiversity features', but they provide a scale of values for different habitats and biodiversity features as defined in national legislation. Since the IFC PS6 is an international standard with global applicability, and one would expect a large variation in the level of development of biodiversity protection policies among countries, the standard provides in some instances some detail, as for instance threshold levels to assign habitats to the different categories. Since the biodiversity protection policies are relatively advanced in Norway, and there exists biodiversity conservation information available to judge the level of vulnerability of habitats and species (i.e. regularly updated Red-lists of habitats and of species), thresholds values are imbedded in these regulations and data. The criteria for Red-list assessments of the different categories (e.g. RE (Regionally Extinct), CR (Critically Endangered), EN (Endangered), VU (Vulnerable), LR (Lower-risk conservation dependent), NT (Near threat), LC (Least Concern)) are all based on different thresholds in population size, habitat available, etc), and follow the IUCN protocol[8]. In Norway, the Norwegian Biodiversity Information Centre is responsible for compiling the national Red-lists with the involvement of a large number of species and habitat experts.

In Tables 4.1 and 5.1 we present to our best understanding, the degree of correspondence between the conservation value criteria in the IFC PS6 and the Norwegian impact assessment in M-1941. It is important to note that 'critical habitats' can be embedded in both natural and

[8] https://www.iucnredlist.org/

modified habitats. The M-1941 addresses this issue by requiring that the project influence area is divided into sub-areas which are homogeneous regarding their conservation value. Hence, it is expected that different kinds of habitats will occur within the project influence area, each of them with different biodiversity conservation value or habitat category.

In Table 4.2, we present general requirements in the IFC PS 6 and the equivalent terms in the NEA M-1941 guidelines. The detailed valuation criteria, i.e. the importance for the Norwegian features is included in Appendix A1.

*Table 4.1 Habitat types. Cross-walk of habitat and biodiversity features typologies used in the IFC PS 6 and the Norwegian Environment Agency guideline (M-1941). The correspondence with the IFC PS6 is based on an evaluation of the M-1941 description. Please note that additional criteria for e.g. critical habitat must be consulted before any habitat designation is fulfilled. For details, see criteria as described in the M-1941 guidelines (in Norwegian).*

| **Broad habitat type (IFC)** | **IFC PS6 definition** | **Interpretation of these areas according to the NEA M-1941 guidelines[9]** |
|---|---|---|
| **Modified Habitat** | 11. Areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. | ***Areas with negligible value for biodiversity*** (NEA M-1941). Negligible value (ubetydelig verdi) is used for areas with very little or no value for biodiversity conservation. These include, e.g. dense forest plantations, infrastructure and buildings, cropland and areas dominated by alien invasive species[10] |
| **Natural Habitat** | 13. Areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. | ***Areas with some value for biodiversity conservation*** (NEA M-1941). This category is used for areas where no particular values for biodiversity protection have been shown, but which are nevertheless not without significance for biodiversity. This is "everyday nature", with a representative flora/fauna for the region, the 'regular' forest areas without important habitat types and of functional importance for species without special conservation interest. These include also urban green areas such as lawns, parks, hedgerows and parks without special natural values (NEA M-1941). |

[9] 1.4.1 *Verditabell* and *Konsekvenstabell for naturmangfold*. Table of value categories for different habitats and biodiversity features and the level of impacts to be considered in Norwegian biodiversity impact assessments according to the NEA M-1941 https://www.miljodirektoratet.no/sharepoint/download-loaditem/?id=01FM3LD2WI7CO67267UJH3RP6EJOFUBP6F

[10] https://www.miljodirektoratet.no/ansvarsomrader/overvaking-arealplanlegging/arealplanlegging/konsekvensutredninger/metode-for-utredning/naturmangfold/1.4-sett-verdi

| | | |
|---|---|---|
| **Critical Habitat** | 16. Areas with high biodiversity value, including:<br>(i) habitat of significant importance to Critically Endangered and/or Endangered species<br>(ii) habitat of significant importance to endemic and/or restricted-range species<br>(iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species<br>(iv) highly threatened and/or unique ecosystems; and/or<br>(v) areas associated with key evolutionary processes. | ***Biodiversity features with (i) intermediate (ii) high** and **(iii) very high biodiversity conservation value*** **(**NEA M-1941).<br>(i)*Intermediate value* is used for biodiversity of regional interest. These are habitats that are important for biodiversity in a county (fylke) or a region.<br>We consider this category as being within the IFC PS6 "critical habitat" because it can be clearly distinguished from that of what is defined in M-1941 as 'natural habitat' ('everyday nature' (hverdags natur)) and it meets the criterion "(i) habitat of significant importance to CE and/or EN species". Both CR and EN species in the Norwegian red list are included in the category intermediate conservation value.. The level of conservation value is given by the quality of the specific locality.<br>(ii) *High value* is used for biodiversity with national or significant regional interest. Biodiversity with high value is included in the "innsigelserundskriv" T2/16)<br>(iii) *Very high value* is mainly used for biodiversity that is protected according to Norwegian law, or that has national or international importance. Biodiversity with very high value is included in the "innsigelserundskriv" T2/16) |

*Table 4.2 General requirements in the International Financial Corporation – Performance Standard 6 (IFC PS6) and those according to Norwegian regulations and described in the guidelines to assess impacts on biodiversity in plans and development projects.*

| **Topic** | **IFC PS6 definition** | **Norwegian regulations & guidelines (NEA N-1941)** |
|---|---|---|
| **Aspects included in the impact assessment on biodiversity** | The risks and impacts identification process as set out in Performance Standard 1 (PF1) should consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts.<br>This process will consider relevant threats to biodiversity and ecosystem services, especially focusing on habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution.<br>It will also take into account the differing values attached to biodiversity and ecosystem services by Affected Communities and, where appropriate, other stakeholders. Where paragraphs 13–19 are applicable | The assessment of impacts on biodiversity follows the guidelines by the Norwegian Environmental Agency (NEA M-1941). Under the theme 'Biodiversity', M-1941 explicitly refers to some of the criteria in the standard, i.e.:<br>(i)Focus on habitat loss degradation and fragmentation.<br>(ii)hydrological changes.<br>(iii) Other criteria, including nutrient loading and pollution are part of other impact evaluation themes. |

| | | |
|---|---|---|
| | (Critical Habitats), the client should consider project-related impacts across the potentially affected landscape or seascape | (iv) The introduction of invasive species is not included under the criteria of impacts assessed.<br>(v)The assessment of the different values attached to biodiversity and ecosystem services by affected communities is not part of the valuation criteria, but there is a requirement of a general/broad assessment of ecosystem services.<br>(vi)There is a requirement of engagement of Sami communities. The Sametinget has developed a guideline about how to engage in impact assessments in planning processes (Sametinget 2021). |
| **Minimize impacts** | As a matter of priority, the client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented. Given the complexity in predicting project impacts on biodiversity and ecosystem services over the long term, the client should adopt a practice of adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the project's lifecycle. | The NEA M-1941 provides a methodology to assess the impacts of one or more project alternatives and a protocol to assess the total level of impact of each alternative, including the level of cumulative impacts. The protocol is then used to compare the total impact between alternatives. The different alternatives can include mitigation and restoration measures to achieve lower levels of overall impact (Table 4.1 and Fig. 2.3). |
| **Implementation of the Mitigation Hierarchy** | The Performance standard applies the mitigation hierarchy to manage the impacts on Critical Habitats. "Where paragraphs 16–19 are applicable (about Critical habitat), the client should retain external experts with appropriate regional experience to assist in the development of a mitigation hierarchy that complies with this Performance Standard and to verify the implementation of those measures. | The mitigation hierarchy is used in the impact assessment in the planning process. The measures to avoid, minimize, restore and offsetting are proposed and described for the different alternatives in the plan (including a '0' alternative, and used to estimate the total impact). |
| **Offsetting** | (i) A biodiversity offset should be designed and implemented to achieve measurable conservation outcomes that can reasonably be expected to result *in no net loss and preferably a net gain of biodiversity; however, a net gain is required in critical habitats*.<br>(ii)The design of a biodiversity offset must adhere to the "like-for-like or better" principle | (i)In the project impact planning phase, planned measures can result in improved conservation status of habitats.<br>(ii)However, the areas whose value can be significantly increased (i.e. "large improvement" (level 3) or "very large improvements" (level 4)) |

| | | |
|---|---|---|
| | and must be carried out in alignment with best available information and current practices.<br><br>(iii)When a client is considering the development of an offset as part of the mitigation strategy, external experts with knowledge in offset design and implementation must be involved. | can only be areas within the biodiversity value categories “negligible” or “of some value” (see Table 4.1).<br><br>(iii)Section 48 of the Nature Diversity Act is the only piece of Norwegian legislation with direct provisions for biodiversity offsetting connected to impacts on protected areas (Lundstein & Haaland 2017)..<br><br>(iv) The review by Lundstein & Haaland (2017) concludes that there are several challenges connected to the use of biodiversity offsetting in Norway including, unclear legal frameworks and guidelines and uncertainty about how biodiversity offsetting should be applied and with which requirements. |
| **Threshold values** | The thresholds presented in the Guidance Note were obtained from globally standardized numerical thresholds published in the IUCN’s A Global Standard for the Identification of Key Biodiversity Areas and Red List Categories and Criteria.<br><br>It is acknowledged that there is no universally accepted or automatic formula for making determinations on critical habitat. The involvement of external experts and project-specific assessments is of utmost importance, especially when data are limited (as will often be the case). | In Norway, the criteria to define biodiversity conservation importance is given in the impact assessment guidelines M-1941.<br><br>Red lists of species and habitats are used for the evaluation of conservation value. The Norwegian Red list assessments also follows the thresholds in the IUCN’s A Global Standard for the Identification of Key Biodiversity Areas and Red List Categories and Criteria. |

# 5 Methods and data to support NNL

This chapter describes ecosystem accounting and its relevance for NNL and the mitigation hierarchy. It also describes three methods used for local areal planning. Finally, we give an overview of some relevant national spatial databases that can be relevant to local area planning.

## 5.1 Ecosystem accounting

Ecosystem accounting is a framework (SEEA EA) developed to provide standardized data on the area and extent of ecosystems, their condition and contribution to human welfare (ecosystem services) (United Nations, 2021). The standard was adopted by the UN Statistical Commission in March 2021. This is the first UN statistical standard where biodiversity and the state of ecosystems are included. It covers all areas included natural ecosystems, urban and agricultural areas as well as marine areas. The standard is cross sectoral, it is not merely a standard for Environmental Agencies. A big innovation is that the standard is geographically explicit, thus making it suitable for different spatial resolutions, including local projects in the energy sector on land and at sea. Data gathered for ecosystem accounting may be used as background data for the mitigation hierarchy and to evaluate NNL.

Norway is committed to report on the standard at the national level to Eurostat in 2026. At the national level, the Norwegian Environment Agency and Statistics Norway (SSB) have the overall responsibility for reporting.

### 5.1.1 The UN ecosystem accounting framework

The SEEA EA constitutes an integrated and comprehensive statistical framework for organizing data about habitats and landscapes, measuring the ecosystem services, tracking changes in ecosystem assets, and linking this information to economic and other human activity[11] [12].

The SEEA EA is meant to integrate this new information into national accounts, hence, the methodologies developed are compatible with the Central Framework of national statistics developed by the United Nations[13]. The data underpinning the SEEA EA, if gathered at the appropriate spatial resolution, can be a very useful resource to implement biodiversity and ecosystem services protection policies such as the EU taxonomy and the restoration Law; and support the use of conservation tools such as the mitigation hierarchy and NNL-related policies.

Ecosystem accounting consists in essence of data infrastructure compiling layers of spatial explicit data on biodiversity and ecosystem service models (Fig. 5.1). The main features of the ecosystem accounting that enable biodiversity and ecosystem services protection actions are:

- *Ecosystem accounting is a systematic collation of spatial data layers* that provides a consistent set of information of the geographic area that is the object of the assessment. It makes available information of the area and condition of different types of ecosystems or nature types, and of spatial models of ecosystem services. If the data infrastructure is in place, it contains information about the area's natural values, their condition and about important functions which society and individuals benefit from (i.e. ecosystem services).

- *Ecosystem accounting is spatial explicit*. Ecosystems and their geographical representation are the basic units of ecosystem accounts. Hence, the ecosystem accounting framework builds on maps of ecosystems and other spatial data layers representing information about ecosystem features. This property of being spatially explicit makes the

[11] https://seea.un.org/ecosystem-accounting

[12] https://www.nina.no/B%C3%A6rekraftig-samfunn/Naturregnskap

[13] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:System_of_Environmental_Economic_Accounting_-_Central_Framework_(SEEA-CF)&oldid=479621

ecosystem accounting framework particularly suited to inform decisions about spatial planning and land-use allocations, and to assess impacts of land take and land-use, for instance in infrastructure development projects through the Mitigation Hierarchy and Environmental Impact Assessment (EIA).

- *Quantitative assessments of the status of ecosystems and their services.* Ecosystem accounting consists of three biophysical and two economic valuation components. Biophysical accounting includes accounting of ecosystem area ("arealregnskap med definerte økosystemtyper"), determining ecosystem condition of these areas ("tilstandsregnskap") and calculating the amount of ecosystem services contributed by the areas ("økosystemtjenester/ naturgoder"). The economic valuation components consist of valuation of ecosystem services use, and economic valuation of natural capital. Natural capital is by the SEEA defined as "*the stock of renewable and non-renewable resources that combine to yield a flow of benefits to people*". In this way, ecosystem accounts support planning and assessment of impacts through the quantification of the extent of the area that is affected and transformed, the changes in ecosystem condition, and finally – through ecosystem services models – changes in the level of benefits provided by nature to society (Fig. 5.1). Ecosystem services models can include those related to carbon uptake and emissions, flood and soil erosion control, and cultural ecosystem services such as outdoor recreation, scenic beauty, and cultural heritage (Rusch et al. 2024).

- *Economic valuation of critical ecosystem functions*. The data supporting the biophysical accounts, can be used together with a wide range of methods of social and economic valuation (IPBES 2022). Some of these approaches relevant for ecosystem accounting in Norway are described in Rusch et al. (2024) and could help to implement Norway's national biodiversity action plan (Meld. St 14 (2015-2016)). "After this (the need to safeguard the threatened species or habitat), *the value of associated ecosystem services and the effects on other public interests (as specified in section 14 of the Nature Diversity Act) will be weighed against each other to determine whether to apply the proposed tools and instruments".*

- *Data base to support quantitative assessments of the value of natural features*. In Norway, there have been important developments of sets of indicators of ecological condition of ecosystems, especially targeting quantitative assessments of the condition of ecosystems (Nybø & Evju 2017, Jakobsson et al. 2020, 2021)[14]. Currently, these indices are suited for national and regional assessments. Ongoing work aims at adapting the set of indicators to local/project level applications.

[14] https://www.nina.no/%C3%98kosystemer/%C3%98kologisk-tilstand. See updated literature on the development of national and regional indies of ecosystem condition in Norway under "publikasjoner"

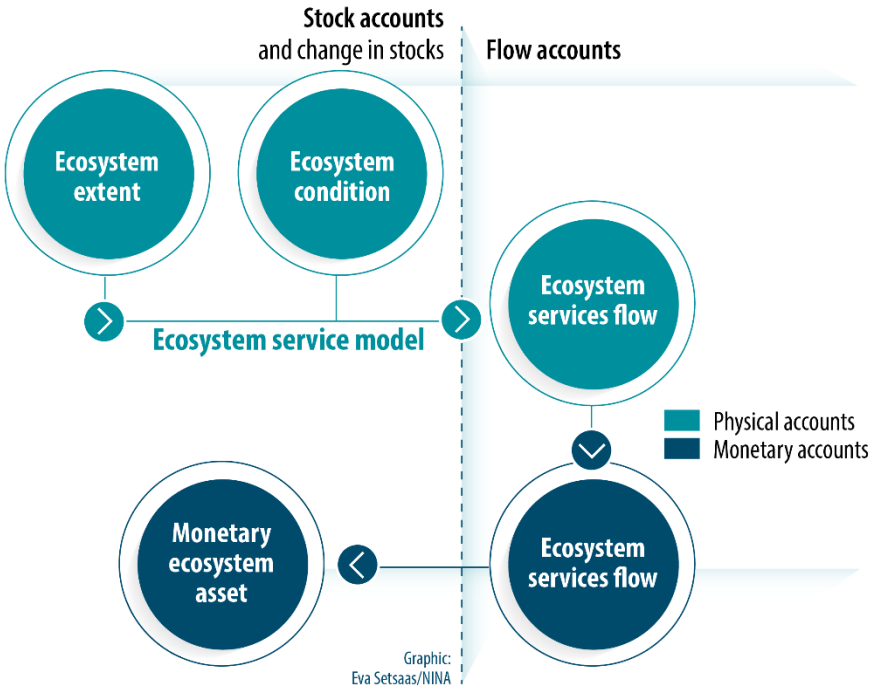


*Figure 5.1: Adapted from United Nations (2021). Ecosystem accounts components according the SEEA EA standard (Source: Rusch et al. 2024). The data underpinning the biophysical accounts (in physical units) can be used to inform decisions about land- and seascape uses and change. The combination of ecosystem extent and condition datasets form the basis to establish natural 'assets' or the 'natural capital'. Physical interventions can be understood as degrading the natural capital. In this context.*

### 5.1.2 Support of ecosystem accounting to conservation policies and tools

The components "ecosystem extent" and "ecosystem condition" are especially relevant to both assess and quantify negative impacts and improvements on biodiversity, for instance when implementing the mitigation hierarchy. Ecosystem accounting at the relevant level of resolution can be a useful tool to assess whether a project (or municipal plans) achieves NNL objectives. Data on ecosystem services will fill gaps in impact assessments by providing quantitative and spatially explicit information on critical functions (such as flood control and water flow regulation, carbon uptake and storage, and recreational value). and other values of nature which are required to be evaluated under other themes in the impact assessment. Ecosystem services models include also the occurrence of nursery sites and of important habitats for recruitment of native populations, which could have informed decisions such as in the case of the sand eel in the example we provided earlier.

Also, indicators of ecosystem condition and ecosystem services models need to be made available at a finer resolution than the national and regional levels. Some condition and ecosystem services indicators with national coverage will be of high relevance to local projects, especially those based on remote sensing. In addition, there is a need to develop more specific condition indicators that are relevant for local decisions. Currently, there is no national initiative to harmonize ecosystem condition indicators for local applications. However, a series of research projects

focus on this, e.g. tests of indicators in Viken county, and Nordre Follo[15] municipality, and the Research Council of Norway-funded project EcoGaps[16].

The spatial data layers collated to build a system of ecosystem accounts can support information needed to evaluate NNL. Table 5.1 describes data that can support information of ecosystem services in Environmental Impact Assessments and NNL strategies. There is also lack of common infrastructures/ databases that make relevant data layers for ecosystem accounting available, but some initiatives have started and are under development (e.g. GIS platform developed by Agder County[17]). Most of the effort is currently concentrated on data layers supporting ecosystem extent accounts. However, development work is ongoing. Rusch et al. (2024) present and overview of ecosystem services models and data available to support their assessment in Norway, and research projects such as SELINA (https://project-selina.eu/) of which NINA is part, aim at improving the basis for the uptake ecosystem services in environmental and biodiversity management decisions, including impact assessments. Also, tests of ecosystem services mapping are being conducted within several research and development projects.

*Table 5.1. Our recommendations for including ecosystem services in ecosystem accounting that can support the Norwegian impact assessment in plans and development projects.*

| **Environmental Impact Assessment criteria** | **Ecosystem Accounting framework (approaches and data for Norway in Rusch et al. 2024)** | **Recommended step of the mitigation Hierarchy** |
|---|---|---|
| 1. Ecosystem services | Biophysical assessment of provisioning, regulating and cultural ecosystem services for twelve main ecosystem types. Ca. 30 critical functions. | Avoid/Minimize (see below for specific ES) |
| 2. Outdoor recreation | Biophysical indicators of the importance of recreation services (also included above within cultural services). | Avoid/Minimize/Restore/Compensate |
| 3. Landscape | Assessments of cultural importance of landscape features (also, included in point 2., cultural ecosystem services). Quantitative assessment of habitat connectivity (can be included under point 1). | Minimize/Restore<br>Cultural importance to be defined through participatory processes. |
| 4. Soil resources | Quantitative assessment of impacts on soil erosion (also, included in point 2, under regulating services). | Avoid/Minimize |
| 5. Sami culture and livelihoods | Participatory assessments of important areas to maintain Sami culture and livelihoods. | Level to be defined through participatory processes |
| 6. Impacts on climate change adaptation | Quantitative assessments of impacts on flood control, peak floods (also included in point 2, under regulating services). | Minimize/Restore |
| 7. Access to public green areas | See point 3 above. | Level to be defined through participatory processes |
| 8. Aesthetic design, expression and quality | Assessments of perceptions of visual impacts. | Level to be defined through participatory processes |

[15] https://www.nordrefollo.kommune.no/vi-utvikler-nordre-follo/klima-og-miljo/arealnoytralitet/
[16] https://www.ciens.no/prosjekter/ecogaps/
[17] https://agdertall.no/areal-og-natur/

### 5.1.3 Accounting for habitats and species

Internationally, some national methods have been developed for biodiversity mapping to be used in local projects (Maseyk et al. 2016). Some the methods are also implemented in regulations (Simensen et al. 2024) and this chapter. NINA is now involved in testing some of these methods in practice that may be useful for ecosystem accounting and NNL goals.

### 5.1.4 Biodiversity metrics and ClimB

*Biodiversity metric 4.0*[18] is a practical metric to measure gains and losses of biodiversity. The work was commissioned by the Department of Environment, Food and Rural Affairs (Defra) and led by Natural England, who developed tool in cooperation with a broad range of users from different sectors and experts. The metrics system aims at incorporating scores for habitat distinctiveness and condition to be used by Defra for their biodiversity offset pilots (Panks et al. 2021). The 4.0 updated version was published in March 2024.

Biodiversity metric 4.0 uses habitats, which relate to NiN- habitat types in Norway as a proxy to describe biodiversity. Habitats are converted into 'biodiversity units', which are calculated using the size of a parcel of habitat and its quality. Most habitat type units are quantified in terms of their extent (measured in hectares), but the metrics includes also linear habitats (e.g., hedgerows and lines of trees and rivers and streams) where habitat length (measured in kilometers) is used (Panks et al. 2021).

Further, habitats are scored according to quality indicators based on:

a. their relative biodiversity value or distinctiveness. Habitats that are scarce or declining typically score highly relative to habitats that are more common and widespread.
b. The condition of a habitat, with scores set relative to other habitat units of the same type.
c. Whether the habitat is sited in an area identified as being of strategic significance for nature (i.e. typically in a relevant local strategy or plan).

Where new habitat is created, or existing habitat is enhanced, the difficulty and associated risks of doing so are estimated. If habitat is created to compensate for losses elsewhere, then the metric also takes account of its proximity to the site of the losses. An important rule of the metric is that the three types of biodiversity units described above are unique and cannot be summed, traded or converted. When reporting biodiversity gains or losses with the metric, the three different biodiversity unit types must be reported separately and not summed to give an overall biodiversity unit value (Panks et al. 2021).

*The ClimB tool* is based on similar accounting principles and adapted to habitat types in Sweden and other Nordic countries[19]. It has been developed with a strong cross-industry commitment, and in close cooperation between companies, trade associations, municipalities, and authorities[20], including the Swedish Environment Agency (Naturvårdsverket). ClimB is specifically designed to quantify impacts on and compensation of biodiversity features along four steps of the mitigation hierarchy[21].

*Use of accounting metrics in Norway.* Neither the Natural England Biodiversity Metrics nor the ClimB tools have been used in Norway, but ongoing work aims at assessing how these tools could be adapted for the Norwegian context. As indicated in section 3.5, considerable development has been done in areas related to ecosystem accounting in Norway, which includes metrics of ecological condition (Nybø & Evju 2017), which could be integrated into the quality scores in

[18] https_//naturalangland.blog.gov.uk/
[19] https://climb.ecogain.se/
[20] https://climb.ecogain.se/collaboration
[21] https://climb.ecogain.se/method

Biodiversity metric and/or ClimB. Currently, ecosystem condition indicators are suited for national and regional level assessments[22] (Framstad et al. 2021), but ongoing research and development work aims at down-scaling indicators of habitat condition at local and project levels[23].

### 5.1.5 Red to Green and STAR

"Red to green" is a suggested framework that allows for a systematic setting of conservation actions through operationalization of national Red Lists by using the quantitative criteria of risk assessment as quantifiable objectives. The Red List Index can be used to quantify potential conservation outcomes of implementing suggested conservation actions (Kyrkjeeide et al. 2021). This was done for at set of species in Norway under the policy-defined goal to downlist species or nature types by one Red List category by the year 2035.

Kyrkjeeide et al. (2021) tested their framework for 123 species and nature types prioritized for conservation by the Norwegian government. Land-use change was identified as the greatest threat, but for 70 % of species and 20% of habitats, knowledge was insufficient to recommend sets of conservation actions that would improve their Red List status. The case shows that reaching national goals is challenging, but possible if main constraints are resolved. Through a systematic assessment of knowledge and conservation actions, the framework forms a solid foundation for developing national action plans for biodiversity conservation, allowing for prioritization and implementation of conservation actions and reporting on progress. This is an important first step to reach national targets defined from international goals (Kyrkjeeide et al. 2021) and could be used as part of a NNL policy for off-site offsetting of remaining impacts.

Another related example of a framework that may assist effective translation of targets from global to national level, is the species threat abatement and restoration (STAR) (Mair et al. 2022), which is also related to the "Red to Green" notion and is based on Red Lists. The methods seek to quantify what conservation measures like e.g. habitat restoration could make to reducing species' extinction risk. STAR has proven a very flexible method and as for the "red to green framework", it allows national target setting to align with global targets under the GBF (Mair et al. 2022).

[22] https://www.miljodirektoratet.no/ansvarsomrader/overvaking-arealplanlegging/naturkartlegging/okologisk-tilstand/

[23] https://www.nina.no/V%C3%A5re-fagomr%C3%A5der/%C3%98kologisk-tilstand

# 6 Options for the implementation of NNL strategies

The mitigation hierarchy provides a widely recognized framework that can enable development projects to account and compensate for negative impacts on biodiversity. The framework has been implemented for considerable time, but the way the different steps are understood has varied largely. Recent evaluations indicate that there are major gaps in its practical implementation to effectively minimize impact and support NNL strategies.

Biodiversity features that are unique (e.g. Panks et al. 2021, Cowling & Pressey 2003) or need protection are difficult to replace or compensate for and therefore impact on such areas should more strictly be avoided. The total impact of a project on biodiversity is not only limited to biodiversity features in need of high level of protection. Even for common habitat types there will be need for compensation outside the project area if the area affected consists mostly of pristine/untouched nature. The NEA M-1941 guideline provides a step-by-step methodology to assess the total impact on the project area. See Table 6.1.

Since areas for impact compensation might be both hard to find and costly, choosing already modified or degraded areas gives opportunities both to minimize the total impact and for restoration measures inside the project area which could more easily lead to achieve NNL or biodiversity gains.

Linguistic inconsistencies are a great challenge for implementation of NNL policies and the mitigation hierarchy (Bull et al. 2016). Lack of convergence may cause conceptual confusion and different perceptions as to what NNL implies or is designed to achieve (Bull et al 2016). In international standards and conventions for biodiversity protection, legislations within the Norwegian management system and other relevant documents, there are various definitions and terms used. For example, the term “priority biodiversity features” in Hydro’s Global Procedure is not the same as the IFC PS6 terms “critical habitat” and “natural habitat”, or the terminology in the Norwegian management system and their valuation terms of habitats and other biodiversity features. It is still possible to find some level of equivalence among definitions, and we suggest an interpretation of the terms, to align the national definitions with those in the IFC PS6 (Table 4.1 and Table 6.1).

We highlight that this comparison is based on our best knowledge and judgement, but there is no official guideline on how to implement the IFC PS6 standard or NNL in Norway. On the other hand, the NEA M-1941 guideline provides the Norwegian methodology to assess levels of impact of development projects and plans.

*Table 6.1 Examples of priority biodiversity features as presented in M-1941 relevant for the assignment of habitat type according to IFC PS6 with linkage to relevant steps of the mitigation hierarchy and available data sources in Norway.*

| **Examples of relevant priority biodiversity feature**<br><br>(as described in M-1941) | **Valuation according to M-1941** | **Equivalent habitat type in IFC PS 6** | **Relevant step in the mitigation hierarchy** | **Data sources** |
|---|---|---|---|---|
| Protected areas<br><br>Including all protected areas, world heritage sites | Very high value | Critical habitat | Avoid | Norges verneområder – Miljødirektoratet (miljodirektoratet.no)<br><br>Lov om forvaltning av naturens mangfold |

| **Examples of relevant priority biodiversity feature**<br><br>(as described in M-1941) | **Valuation according to M-1941** | **Equivalent habitat type in IFC PS 6** | **Relevant step in the mitigation hierarchy** | **Data sources** |
|---|---|---|---|---|
| and “selected habitat types” under the Nature Diversity Act § 52 | | | | (naturmangfoldloven) - Kapittel VI. Utvalgte naturtyper - Lovdata |
| Habitat types according to the NEA instructions (Miljødirektorates instruks) | Various values | Natural/Critical habitats | Given high or very high value; Avoid<br><br>Minimize<br>Restore | Naturbase<br><br>Valuation based on fact sheet on “Naturbase” or directly from mapping<br><br>Naturbase kart (miljodirektoratet.no)<br><br>Expert assessments |
| Species of national management interest, including functional ecologic habitat; e.g.<br><br>-threatened species (CR, EN , VU on the Norwegian Red List for threatened species)<br><br>-Species prioritized under the Nature Diversity Act<br><br>-Protected species | Intermediate, High or Very high value | Critical habitat | Avoid,<br><br>Minimize<br><br>Restore | Red List of threatened species<br>Rødlista 2021 - Artsdatabanken<br><br>Miljødirektoratet - Kartkatalog (miljodirektoratet.no) – Datasett Arter av nasjonal forvaltningsinteresse<br><br>Expert assessments |
| Red-listed and threatened species | Valuation will follow Red list Categories | Dependant on Red List Category<br><br>if category CR, EN, VU – critical | Avoid<br><br>Minimize<br><br>Restore | Rødlista 2021 - Artsdatabanken<br><br>Artskart<br><br>Expert assessments |
| Protected species | High or very high value | Critical habitat | Avoid | Forskrift om fredning av truede arter - Lovdata |

| **Examples of relevant priority biodiversity feature**<br><br>(as described in M-1941) | **Valuation according to M-1941** | **Equivalent habitat type in IFC PS 6** | **Relevant step in the mitigation hierarchy** | **Data sources** |
|---|---|---|---|---|
| Prioritized species | | | | Forskrifter om prioriterte arter - Kongelig resolusjon (regjeringen.no)<br><br>Expert assessments |
| Wild reindeer habitats | High er very high value<br><br>10 designated areas have very high value, 14 have high value | Critical | For the very high value areas; Avoid<br><br>For the high value areas: Avoid Minimize | Naturbase kart (miljodirektoratet.no)<br><br>Expert assessments |
| Species of particular concern | High value | Critical | Avoid | Miljødirektoratet - Kartkatalog (miljodirektoratet.no)<br><br>Expert assessments |

**Data**

*Biodiversity mapping.* The NEA M-1941 guidelines indicate for each biodiversity feature described the data sources and provide links to these sources. The 'Naturbase' is a national a repository of biodiversity features (e.g. protected areas, habitat types (Handbook 13 and Miljødirektoratets instruks). Species occurrences are often reported at the Norwegian Biodiversity Information Centre. However, there is no complete coverage of either species occurrences or habitat maps. There is considerable work ahead to produce maps representing the occurrence of specific ecosystem/habitat types and species.

Hence, there is considerable work ahead to produce maps representing the occurrence of specific ecosystem/habitat types and species. Norway has recently developed a typology of ecosystems that is compatible with international reporting standards (Framstad et al. 2022). However, the existing ecosystem maps (Strand et al. 2023) are based on a very coarse level typology, not suited for local and project level assessments. In principle, this means that more detailed mapping of habitats needs to be performed for impact assessments at project level. Norwegian municipalities have engaged in mapping habitats according to the Natur I Norge (NiN) methodology

in areas that have preliminarily been identified for infrastructure development, but generally NiN habitat maps are lacking. Regarding “ecological condition” of ecosystems The development of indicators for specific habitat types to be applied at local and project level is still ongoing.

To establish a system where negative impacts of projects on biodiversity can be compensated, quantitative metrics of improvement are desirable. Methods developed for the most threatened species and habitats (truet natur) that have been developed in Norway with the aim to quantify the likelihood of the improvement in conservation status (from red-lists to ‘green-lists) provide an excellent opportunity (Kyrkjeeide et al. 2021). At the landscape level, the spatial data sets and the metrics of habitat functionality developed within the GREENPLAN (Van Moorter et al. 2023, Dorber et al. 2023, Panzzachi et al. 2023,) project in Norway also provide an excellent data set to quantify the level of habitat disruption (due to the project’s negative impacts) or the enhancement of habitat connectivity if restoration measures on landscape-level biodiversity features would be used to compensate impacts.

**Operationalizing compensation/offsetting**

Operationalizing compensation schemes is challenging and has not been properly implemented in Norway and have presented considerable challenges in other countries. A first step is to define the magnitude of the impact and what would be needed for the impact to be compensated. In this context, much of the debate has revolved around the definition of equivalency and currency (McKenny and Kiesecker, 2010), i.e. compensating the impact on similar features and the processes that have been negatively affected. Compensation requires trading between ecological elements, but trading between biodiversity components that differ in type, location, time or ecological context is challenging (Bull, 2013). The Norwegian Ministry for Transportation looked for instance, into opportunities to use habitat banking as a mechanism to support offsetting back in 2013 but concluded that this was only possible after testing and evaluating ecological compensation as a tool because implementing compensation banks would require major separate processes (Samferdselsdepartementet, 2013).

A second important challenge is to evaluate the overall impact of a project, since, in addition to the effects on habitats, large projects often have an impact at the landscape or regional levels depending on the habitat requirements of species (Bull et al. 2014). Biodiversity features can also have international, national, regional, or local importance (M-1941). The Norwegian guidelines for impact assessment address these issues in various ways including the criteria of conservation importance (national, regional, local), the requirement of assessing cumulative impacts, and that of delineating both the project and the project influence area, which may be challenging without enough knowledge about the ecological processes that are affected.

However, a well-designed compensation system that consider local, regional, and national actions under the same framework, in a coordinated manner towards an overarching common goal for conservation efforts (Arlidge et al. 2018) could support efforts to revert biodiversity loss trends. New opportunities for establishing indirect off-setting mechanisms could arise from, for instance, restoration targets under the GBF and regulatory frameworks such as the European Nature Restoration Law, which aims to broadly address habitat degradation. The law was adopted in July 2023 and aims at “restoring wetlands, rivers, forests, grasslands, marine ecosystems, and the species they host to help increase biodiversity, secure the things nature does for free, like cleaning our water and air, pollinating crops, and protecting us from floods, and limit global warming to 1.5°C”. The modes in the European Restoration law could shape Norwegian legislation as well, since both would aim to help comply to commitments under the GBF.

## 6.1 Final considerations

Finally, we wish to share some reflections about how we perceive the current situation regarding the development of standards for assessing and reporting on the impacts of projects on biodiversity. Several regulations and international agreements have been developed recently, there are ongoing processes to follow up these commitments through the definition of how these regulations will be implemented in different countries. As mentioned earlier, Norway is revising the BSAP following the Kunming-Montreal Agreement, including those related to regulations that address the private sector. In a period of transition, changes are to be expected. Since some reporting obligations will start already in 2024, one option would be to start formulating goals more generally, for instance avoiding specifying that NNL objectives will refer to compensation when affecting 'critical habitats' only, since there may come more stringent requirements in the future about which features on which impact has to be avoided, and how to evaluate compensation levels.

It is likely that these processes will lead to national norms about how to implement the mitigation hierarchy more consistently across sectors (i.e. energy, transport). The NEA guidelines (M-1941) about the assessment of impacts on biodiversity in plans and projects shows a step in this direction.

Further, there is currently no operationalization of the NNL concept in Norway (i.e. which impacts should be compensated for, and how). Ongoing revisions of the BSAP, could include such guidelines. A second consideration is that to compensate for negative impacts on 'critical habitats' or on 'priority biodiversity features' requires a national normative definition of these terms, as well as a normative agreement of which kind of negative impacts can be or should be compensated for. In our description of the mitigation hierarchy and NNL approaches, we stress that choices of areas that already have significant human impacts, would be preferable to choose as locations for the establishment of new projects. This would lead to avoid more easily negative impacts on biodiversity features that require conservation actions. At the same time, NNL objectives would be more easily achievable through the opportunities for on-site restoration that degraded ecosystems provide.

We notice that risks related to ecosystem services should also be identified (and minimized and likely compensated for) in the project area according to the IFC PS6. The work planned on ecosystem accounting (see section 5.1 and Rusch et al. 2024) would provide the data necessary for these assessments.

One recommendation would be to start by having an ambition of following strictly the impact assessment guidelines in M-1941 while:

- informed by high quality data (see e.g. Boyle et al. 2024),
- evaluated by highly qualified practitioners,
- make available all data collected during the entire impact assessment period (e.g. mapping data on biodiversity and habitats), following FAIR principles of data sharing[24] (see e.g. Boyle et al. 2024 on the importance of access to existing data sources),
- careful planning to avoid unnecessary physical impact and damage,
- education and engagement of qualified personnel in restoration practice in the construction phase to minimize physical impact,
- engage and contribute to the formulation of future standards,
- being prepared for the revision of the standards with some regularity. This would be most fruitful by critically monitoring of the consequences of actions (even long term) and by establishing a system of adaptive management which enables learning and improving.

[24] https://www.openscience.no/apen-forskning/forskningsdata/fair

# 7 Abbreviations

*Table 7.1 Abbreviations used in this report.*

| | |
|---|---|
| CBD | The United Nations Convention on Biological Diversity |
| CSRD | Corporate Sustainability Reporting Directive |
| ESRS | European Sustainability Reporting Standards |
| EU | The European Union |
| IFC | The International Finance Corporation |
| IFC PS 6 | The International Finance Corporation Performance Standard 6 “Biodiversity Conservation and Sustainable Management of Living Natural Resources” |
| IPBES | The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services |
| IPCC | The Intergovernmental Panel on Climate Change |
| GBF | The Global Biodiversity Framework under the Kunming-Montreal Agreement of the CBD |
| GRI | Global Reporting Initiative |
| NiN | Natur i Norge |
| NNL | No net loss |
| SBTN | Science Based Targets Network |
| SDGs | Sustainable Development Goals |
| SEEA-EA | System of Environmental Economic Accounting – Ecosystem Accounting (Naturregnskap etter FN-standarden) |
| TNFD | The Task Force on Nature-related Financial Disclosures |
| UN | The United Nations |

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# 9 Appendices

## Appendix I Table A1

*Table A.1, Criteria for the assessment of cumulative impacts according to the Norwegian Environment Agency M-1941 guidelines.*

| Cumulative Impact | Criteria for assessment of cumulative impacts |
|---|---|
| Critical negative impact | The measure results in destruction or degradation of nationally or internationally important areas for biodiversity conservation. The category should be used for areas with *high* or *very high* conservation value or when the cumulative impact is very large:<br>- Several sub-areas with impact level. Very serious impact (4 minus) or<br>- Serious impact (3 minus).<br>- Very large cumulative impact. |
| Very large negative impact | The measure results in destruction or degradation of nationally important areas for biodiversity conservation. The category should be used for areas with *high* or *very high* conservation value or when the cumulative impact is large.<br>- Predominance of sub-areas with impact level Serious (3 minus).<br>- One or several sub-areas have impact level Very serious (4 minus).<br>- Large cumulative impact. |
| Large negative impact | The measure results in impacts for biodiversity within the project influence area.<br>- Predominance of sub-areas with impact level Significant (2 minus).<br>- Several sub-areas with impact level Serious (3 minus)<br>- One sub-area may have impact level Very serious (4 minus)<br>- Contributes to increase the level of cumulative impact. |
| Intermediate negative impact | The measure results in intermediate level of impact for biodiversity within the project influence area.<br>- Predominance of sub-areas with impact level Some impact (1 minus).<br>- Several sub-areas have impact level Significant/Intermediate (2 minus).<br>- Several sub-areas may have impact level Serious (3 minus).<br>- No sub-area receives Very serious impacts (4 minus). |
| Some negative impact | The measure results in some impacts on biodiversity within the project influence area.<br>- Sub-areas have low levels of impact.<br>- Predominance of sub-areas with Some impact level (1 minus) or negligible impact (0).<br>- A couple of sub-areas can receive Significant/Intermediate impact (2 minus)<br>- No sub-areas receive Very serious (4 minus) or Serious (3 minus) impact levels. |
| Negligible impact | The measure will not result in significant changes for biodiversity.<br>- Predominance of sub-areas with negligible impact (0).<br>- One sub-area can receive Some impact (1 minus).<br>- No sub-areas receive Very serious (4 minus), Serious (3 minus) or Significant/Intermediate impact (2 minus). |
| Positive impact | This level of cumulative impact is used in sub-areas with *negligible* or *some* conservation value and which significantly increase their value because of the implemented measures.<br>- Predominance if sub-aeas with positive impacts level 1 or 2 plus.<br>- Can only include sub-areas with some negative impact.<br>- Sub-areas with Some negative impact (1 minus) are clearly outweighted by areas with positive impact levels. |
| Large positive impact | This level of cumulative impact is used in sub-areas with *negligible* or *some* conservation value which highly increase their value because of the implemented measure. |

| | |
|---|---|
| | - Predominance of sub-areas with Very large positive impact (4 plus)<br>- Predominance of sub-areas with very positive impact.<br>- May only include sub-areas with low negative impact level. Sub-areas with negative impacts are clearly outweighed by areas with positive impact. |

# Appendix I Table A2

*Table A.2. Assessment of impact of project related interventions. For species and habitat types the impact will be assessed for each sub-area of the plan or project area (delområde) or from the impact of the species' population size objectives/distribution. The assessment needs to refer to management objectives for the species, habitat types and ecosystems. NEA M-1941.*

| **Biodiversity feature category assessed/Status after intervention** | **Improved** | **Negligible** | **Not degraded** | **Degraded** | **Very degraded** |
|---|---|---|---|---|---|
| Protected areas (Vernet natur etter norsk lov). | Improves the condition of the area through restoration towards it original condition. | No or negligible negative effects | Some impact (e.g. activity level, pollution, border-effects). No direct intervention in the area. | Minor impacts (e.g. level of activity, pollution or border-effects) that affect a minor part of the area.<br><br>The intervention does not violate the objectives of the protected area (verneformmålet). | Direct intervention on the protected area.<br><br>Violates the goal of the protected area (verneformålet). |
| Habitat types | Improves the condition through the restoration towards original condition of the habitat that had impacts/been degraded prior to the project. | No or negligible impact | Direct impact on the area affects less than 20% of a part of the locality of low importance.<br><br>Minor impact on the 'remaining area' (restareal).<br><br>Reduces/impairs the distribution/condition of the habitat type locally/regionally, ev. impairs the likelihood to achieve the goals for the habitat type in the Norwegian Nature Diversity Act (LOV 2009-06-19. | Direct impact of 20-50% of a part of the locality with of importance.<br><br>Some impact (level of activity, pollution and border effects) on the 'remaining area' (restareal).<br><br>Reduces/impairs the distribution/condition of the habitat type locally/regionally, ev. It impairs the likelihood to achieve the goals for the habitat type in the Norwegian Nature Diversity Act (LOV 2009-06-19. | Direct impacts in the most important part of the locality.<br><br>Direct impact in more than 50% of the area. Direct area impacts in 20-50% of a part of lower importance, but the remaining area (rest-areal) lose its ecological qualities and/or functions.<br><br>Reduces/impairs the habitat type national /international distribution/condition, ev. With high certainty impairs the likelihood to achieve the conservation goals for the habitat type. |
| Species with function-areas | Restores or creates new migratory/dispersal possibilities between the species habitats (including water courses). | No or negligible impact | Breaks up/disrupts connectivity/reduces functions, but critical functions are largely maintained. | Breaks up and/or disrupts/degrades areas so that functions are impaired.<br><br>Impairs dispersal/migration | Breaks up and/or disrupts/degrades areas so that functions are disrupted. Blocks dispersal/migration where there are not alternatives. |
| | Improves/strengthens Important biological functions. | | Minor impact on dispersal/migration possibilities and several alternative routes exist.<br><br>Reduces the species population locally/regionally, ev. Contributes to some extent to impair the likelihood to reach the Norwegian Nature Diversity Act's conservation goal for the species. | possibilities, ev. Hinders/blocks dispersal/migration possibilities where alternative routes exist.<br><br>Reduces the species population size regionally/nationally, ev. Can impair the likelihood that the conservation goals for the species in the Norwegian Nature Diversity Act. | Reduces the species population size nationally/internationally, ev. Impairs the likelihood to achieve the conservation goals for the species in the Nature Diversity Act. |

| | | | | | |
|---|---|---|---|---|---|
| Landscape ecological connectivity | Restores or creates new migratory/dispersal possibilities between the species habitats (including water courses).<br><br>Improves/strengthens important biological functions. | No or negligible impact | Breaks up/disrupts connectivity/reduces functions, but critical functions are largely maintained.<br><br>Minor impact on dispersal/migration possibilities and several alternative routes exist. | Breaks up and/or disrupts/degrades areas so that functions are impaired.<br><br>Impairs dispersal/migration possibilities, ev. Hinders/blocks dispersal/migration possibilities where alternative routes exist. | Breaks up and/or disrupts/degrades areas so that functions are disrupted. Blocks dispersal/migration where there are not alternatives. |
| Geotopes (landforms) | Can reveal/uncover new geological sites. | No or negligible | Affects a part of minor importance | Affects 20-50% of the locality but minor | Affects the entire or most of the area (>50%). |
| | Important geological functions can be strengthened. | impact on short and long term. | which in turn encompass less than 20% of the locality. Minor degradation of the remaining area (restareal). | degradation of the remaining area (restareal). No degradation of the most important part of the locality. | Affects >50% of the area, but the most important (most valuable) part is destroyed.<br><br>The remaining area (restarealen) loses its geological qualities and/or functions. |

# Appendix II The EU Taxonomy

The EU taxonomy was first designed to help implement EU's climate targets as were defined in the Paris Agreement under the UNFCCC (European Commission 2018) to which Norway also adheres (Norwegian Ministry of Climate and Environment 2020-2021), Developments to integrate biodiversity protection and sustainable use targets have been ongoing, but it is first with the GBD agreement that new specific targets for biodiversity have been formulated, and on which the EU taxonomy can be developed, as a tool that can help advance in operationalizing action to meet these targets. In this context, increased transparency in monitoring and reporting of actions and its impacts is considered a pilar to protect and sustainably use nature. The GBF states that improved reporting leads to increased transparency of companies and businesses financial activities and projects and helps to hold them accountable for the same activities and projects.

The EU Taxonomy is, as stated earlier in the report, a classification system that aids companies and investors to identify environmentally sustainable activities to make sustainable investment decisions (Fig. A1).

To be classified as a sustainable economic activity, a company must contribute to at least one of the following six objectives while simultaneously avoiding violating the others (Article 9).

1) Climate change mitigation
2) Climate change adaptation
3) Sustainable use and protection of water and marine resources
4) Transition to a circular economy
5) Pollution prevention and control
6) Protection and restoration of biodiversity and ecosystems.

For example, an activity that aims to mitigate climate change, but that negatively affects biodiversity and ecosystems, cannot be classified as "green" or "sustainable". The classification of an economic activity in terms of sustainability rests on four criteria, which are based on the environmental objectives. These criteria are:

1) The economic activity contributes to one of the six environmental objectives.
2) The economic activity does "no significant harm" to the rest of the five environmental objectives.
3) The economic activity meets the minimum safeguards as UN Guiding Principles on Business and Human Rights to not have a negative social impact.
4) The economic activity complies with the technical screening criteria developed by the EU Technical Expert Group

**Operationalization of the EU taxonomy**

The EU taxonomy has been tuned to help achieve the European Green Deal's objectives and targets by helping to scale up investments in projects and activities (Figure A1). The EU taxonomy is a tool that helps in this direction in the sense that it:

1) Creates a frame of reference for investors and companies.
2) Supports companies in their efforts to plan and finance their transition.
3) Protects against greenwashing practices.
4) Helps accelerate financing of those projects that are already sustainable and those needed in the transition.

The intention is that corporate activities will contribute achieve the EU Green Deal's goals. explicitly, as referred earlier, these are:

1. Greenhouse gas emissions are reduced by at least 55% by 2030 compared to 1990 levels.
2. There are no net emissions of greenhouse gases by 2050.
3. The EU society is fully adapted to the unavoidable impacts of climate change by 2050.

4. The EUs natural capital is protected, conserved and enhanced.
5. The health and wellbeing of citizens from environment-related risks and impacts is protected.
6. No person and no place are left behind.

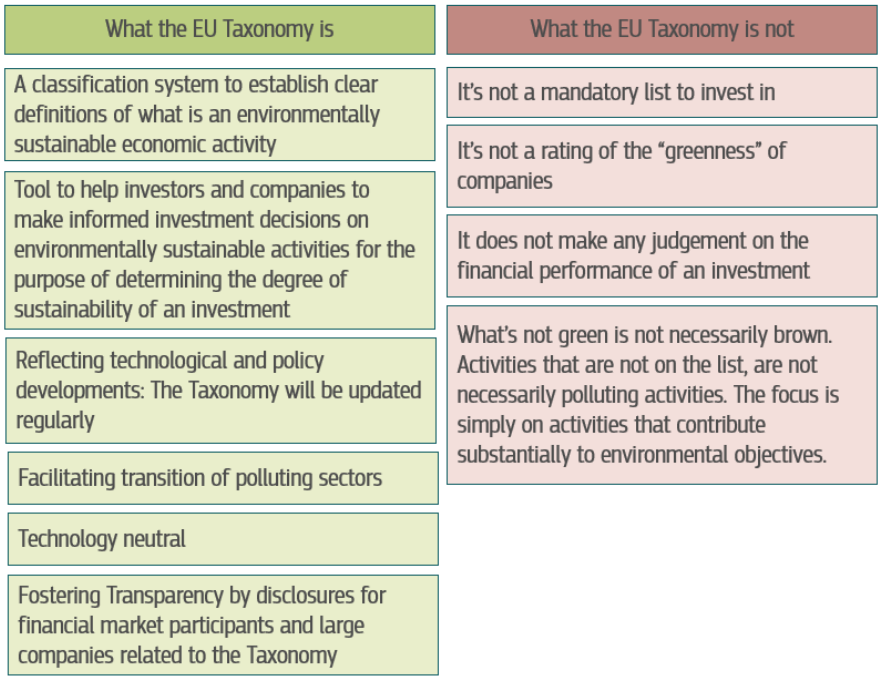


*Figure A1. Example of what the EU Taxonomy is and is not. (Taken from EU Taxonomy Navigator: https://ec.europa.eu/sustainable-finance-taxonomy/)*

## Appendix III ESRS - European Sustainability Reporting Standards

The ESRS standards are reporting standards for sustainability within the European Union (EU). The standards cover environmental, governance issues, social, climate change, biodiversity, and human rights, providing information for investors to understand the sustainability impacts of the companies in which they invest.

According to EU law, all large companies and all listed companies are required to disclose information on what they view are the opportunities and risks arising from environmental and social issues, and on the impact of their activities on people and the environment.

The objectives of the ESRS E4 Biodiversity and Ecosystems standard are to understand how the company (undertaking) affects biodiversity and ecosystems regarding their negative and positive, as well as actual and potential impacts. To understand that any actions that are taken and their results, to prevent or mitigate material negative actual or potential impacts and to protect and restore biodiversity and ecosystems. To understand that the plans and capacity of the company to adapt its strategy and business model(s) in line with and respecting the planetary boundaries of the biosphere integrity and land-system change; the outlined targets in the Post-2020 Global Biodiversity Framework of no-net loss for 2030, net gain from 2030, and the full recovery from 2050; the EU Biodiversity Strategy for 2030 along with the targets set under the EU Nature Restoration Plan and Enabling Transformative Change, and comparable amended or new frameworks and strategies.

# Appendix IV TNFD - The Taskforce on Nature-related Financial Disclosures

The Taskforce on Nature-related Financial Disclosures aims to provide decision-makers in business and capital markets with better information through corporate reporting on nature that improves enterprise and portfolio risk management (TNFD, n.d.). TNFD is a market-led and science-based initiative that is supported by national governments, businesses, and financial institutions across the globe. Its recommendations have been designed to be consistent with the global baseline for corporate sustainability reporting and to be aligned with the global policy goals in the Kunming-Montreal Global Biodiversity Framework.

The TNFD disclosure framework consists of conceptual foundations for nature-related disclosures, a set of general requirements, and recommended disclosures that are structured around four pillars of recommendation: (1) governance, (2) strategy, (3) risk and impact, and (4) metrics and targets.

Regarding metrics and targets, the TNFD recommends companies three types of disclosures:

A. Disclose the metrics used by the organization to assess and mange material nature-related risks and opportunities in line with its strategy and risk management process.
B. Disclose the metrics used by the organization to assess and manage dependencies and impacts on nature.
C. Describe the targets and goals used by the organization to manage nature-related dependencies, impacts, risks and opportunities and its performance against these.

The operationalization of the mitigation hierarchy, including the choice of indicators to guide decisions at each step of the hierarchy can provide the basis to meet the proposed metrics disclosure recommendations by TNFC.

**The TNFD LEAP Approach**

Building on previous TNFD work such as the Performance Standards, the TNFD launched in October 2023 the LEAP Approach. The approach is based on existing frameworks for identifying, assessing, managing, and disclosing nature-related issues (especially the Science Based Targets Network – SBTN). It is an integrated approach to help businesses conduct the due diligence necessary for the assessment of nature-related issues. LEAP stands for:

1. **Locate** your interface with nature.
2. **Evaluate** your dependencies and impacts on nature.
3. **Assess** your nature-related risks and opportunities.
4. **Prepare** to respond to, and report on, material nature-related issues, aligned with the TNFD's recommended disclosures.

*Figure A2.: A depiction of the LEAP Approach (Source: https://tnfd.global/publication/additional-guidance-on-assessment-of-nature-related-issues-the-leap-approach/)*

The approach draws on a large body of organisations' work including scientific foundations (e.g., the IPCC, IPBES, and the CBD) and guidance on stakeholder engagement (e.g., the IUCN, OECD), among many others.

As part of the response to risks and opportunities, the LEAP Approach advocates for the AR3T Framework which is akin to the Mitigation Hierarchy, yet different as it does not mention explicitly the term compensation/offsetting, but rather focuses on activities directed to regenerate and restore, which to a large extent aligns with the descriptions we provide in the sections on the mitigation hierarchy. This framework consists of four actions that should be followed sequentially:

1. **Avoid**: preventing negative impacts from happening in the first place; eliminating negative impacts entirely
2. **Reduce**: minimising negative impacts that cannot be fully eliminated.
3. **Regenerate**: take actions designed within existing land/ocean/freshwater uses to increase the biophysical function and/or ecological productivity of an ecosystem or its components, often with a focus on a few specific ecosystem services.
4. **Restore**: initiating or accelerating the recovery of an ecosystem with respect to its health, integrity, and sustainability, focusing on permanent changes in state.

Across these actions includes **transformative action**, meaning the ways organisations can contribute to needed systemic changes inside and outside of their value chains.


## Appendix V – The Åkersvika case

We provide here first a description of the case of upgrading the E6 highway through the Åkersvika Nature Reserve and Norway's first RAMSAR site as an example of impact evaluation and compensation process, the criteria that were evaluated and the decisions that were made regarding the evaluation of impacts, compensation options, as well as the criteria used to determine the achievement of biodiversity no net loss. In a second section, we present some reflections about the implementation of the mitigation hierarchy in Norway and about how its potential to help achieve biodiversity no net loss could be improved.

The case of compensation of Åkersvika nature reserve is one example where compensating measure were carried out both on-site and off-site from the development location. The compensation was done in relation to the highway extensions project of the E6, section Kåterud to Arnkvern in Hamar and Stange municipality. Several compensative measures were carried out near Åkersvika Nature reserve, but the majority of the compensation was the establishment of the conservation protection of Stilla- and Bratuestilla nature reserve, 115 km afar from Åkersvika.

It also exemplifies a series of decisions and measures, which fail to be aligned with several alternatives proposed in recent years that can strengthen the role of the mitigation hierarchy as a framework to achieve more ambitious national conservation objectives, aligned with international commitments, including the signature of the GBF (2023).

The protection of Åkersvika nature reserve was established 21st December 1974 and protected as the first Norwegian site under the Convention for Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR) the same year due to its international significance as important habitat for wetland birds. The purpose of establishing the nature reserve has been to preserve a valuable wetland area as a dynamic and complex inland delta with lakes and meanders, and a wide variety of habitats, including rich formations of soft bottom communities, marshland, wet meadows, floodplain woodland and other forest ecosystem. The area is particularly important for biodiversity in the form of resting and breeding areas for wetland birds and as a habitat for rare and endangered plant and animal species. The E6 was built in the 1960s, a decade prior the protection.

The local development plan (kommunedelplan) for the highway extension with its associated impact assessment was in 2008 approved by the local authorities Hamar and Stange municipality. Among six alternative routes, only two were recommended for final consideration; extending the existing highway though Åkersvika nature reserve from two to four lanes, or build the highway outside the reserve, but confiscating cultivated/agricultural land. Two of the departments of the County Governor of Hedmark objected against both alternatives; the department of Environment raised concerns for the negative impacts both alternatives would affect conservational values of nature within the reserve, and important agricultural land. The department of Agriculture raised concerns for the negative impact it would have on cultivated land. The county governor could not mediate between the two departments, and the project was brought up to the Ministry of Environment to make a final decision.

The final decision was made in April 2013, after four years of assessing the alternatives, including the four other alternatives that were suggested in the local development plan. During the four-year period, representatives from RAMSAR were consulted to give their advice and recommendations on compensation According to the convention's resolutions. The Environmental Ministry (2013) concluded that the highway upgrade could continue by expanding the existing highway within the reserve, on the condition that specified requirements would be pursued.

We list some of the conditions (The Ministry of Environment, 2013) and add own considerations considering the recommendations in recent literature which highlight the potential of the mitigation hierarchy to improve current biodiversity conservation policies which can better enable the achievement of biodiversity conservation goals, including broader no-net-loss strategies.

1. *A regulation plan (reguleringsplan) should be developed in parallel with a plan for mitigating and compensation (plan for avbøtende og kompenserende tiltak)*. These two plans are normally developed individually, but in this case, they were required to be executed in combination to have a collaboration on the ecological knowledge, placement of the replacement areas, and placement of the mitigating, restoring, and offsetting measures. Following the criteria described above and given that the area was protected under national regulation and a site protected under the RAMSAR Convention, the first step of the mitigation strategy (avoid) should have been applied. There seems that several alternatives were evaluated but the option to avoid was given the lowest value.
2. *The county governor would coordinate the project between the responsible environmental management and the road management together with the developer (Statens Vegvesen at the time)*
3. *Follow the guidelines and principles given by RAMSAR in addition to the articles that are embedded in the convention's Resolution VII.24 (1999) and Resolution VIII.20 (2002) (e.g* Replacement areas need to be found outside the existing nature reserve and replaced with the ratio of 3:1. The replacement area is also according to the RAMSAR resolutions to be given the same conservation status as the areas being replaced. OR a list of minimizing measures to conserve the ecological status for the wetland area during the construction (see reference RAMSAR (2010)
4. *A plan for monitoring the minimizing and offsetting measures with follow-up surveys after the road was finished*. This document (Fylkesmannen I Hedmark, 2015) was published in 2016 and according to this plan the minimizing, restoring and compensative measures should be monitored 5 years after the construction is finalised. Although monitoring of these measures is a good measure to document the effectiveness in the long turn, monitoring does not guarantee success, neither biodiversity NNL. An alternative plan and ambitious plan for the highway could have been, for instance, to construct the highway outside the protected area, and to remove the current infrastructure as a compensation/offsetting measure.
5. *Replacing permanent ponds/reservoir (dammer) that are negatively affected by the construction on the east side with new permanent ponds (dammer).*

6. *An ecological assessment for the whole nature reserve (this means also outside the construction area) to develop how the minimizing measures are to be executed (e.g. which areas would be restored as wetland areas, the ecological consequences of measures on cultivated land, the location of new water surfaces/nutrient rich ponds with islands, replacing road fillings with bridge)*. One reflection on these elements of the offsetting measure is that upfront uncertainty about both the costs and the ecological quality of the results related to the compensation activities. A decision of 'avoidance' could have both avoided important impacts on nature with high requirements of protection, as well as the costs related to the actual compensation activities and the
7. Requirements for minimizing measures during the construction phase (e.g. Establishing water thresholds to minimize negative effects for plants and water ecology; sound barriers; establish a system for collecting and cleansing of stormwater and runoff-water from the E6 and other roads close to the nature reserve).

The ecological mapping of Åkersvika nature reserve and the preparation of the regulation plan and the plan for minimizing and compensation was executed the following years in the period 2013-2015. During this phase some of the recommended measures suggested by RAMSAR was altered as the field observations identified red listed species and nature types (NiN) that had a high priority of conservation. The construction phase was set to start in 2016-2020 by Nye veier. The highway construction was finished in 2020, and Nye veier had the responsibility that Statens Vegvesen previously had planned in collaboration with the local environmental authorities.

*Results of the Åkersvika project*
Despite that an evaluation of the measures was set to be assessed five years after construction (Fylkesmannen I Hedmark, 2015), the Norwegian Environment Agency published in March 2023 an evaluation report (Multiconsult and NaturRestaurering, 2023) of the compensated measures in Åkersvika nature reserve to document and report to the RAMSAR convention. The authors of this report acknowledge that the assessment had been conducted with limited data for comparison, including the lack of systematically collected data to compare the pre- and post-construction surveys, and without doing what was proposed in the monitoring report written together with the compensation plan. The evaluation from this report is still relevant to highlight the processes of implementing ecological compensation measures and the experiences from this process.

The report (ibid.) concluded that no net loss was achieved in terms of multiplying hectares of nature types. 12.6 ha were removed from Åkersvika for the purpose of the highway. 18 ha was added to the existing border of Åkersvika, and a new nature reserve of 59.6 ha was established as the offset area. According to the report the condition set by the Ministry of Environment to replace in the ratio of n 1:3 was achieved due to the establishment of the new nature reserve which in total resulted in a compensation ratio of 1:6, thus avoiding no net loss. Despite the high offsetting ratio, the uncertainty of this particular measure is related to the question of additionality and the principle for like-for-like, and if the compensated areas are equivalent to the areas lost (ibid.) As indicated above, the establishment of protected areas is the least recommended compensation measures when compared to actions with more additionality such as ecological restoration of off-site habitats or habitat creation.

The authors of the evaluation report list up the following aspects for further considerations and reccomendations regarding compensation in Åkersvika and in Norway in General:

- *NNL had been largely achieved and it would be likely more challenging to achieve NNL in more pristine area where impacts would not be dwarfed by other sources of impact*. We understand here that NNL was interpreted *sensu stricto* although the requirement of quantitatively assessing the impacts (including cumulative impacts of the new infrastructure) seem to have been neglected.

- *Clear documentation on roles and responsibilities should be ensured from the outset and monitored at project milestones in future projects*. Some compensation measures were not implemented due to lack of clarity or misunderstandings about roles and responsibilities of the different actors.
- *"Greater clarity and predictability on compensation requirements, alternatively closer coordination with relevant authorities during planning, should be ensured*." (p.12)
- *A financing model for covering monitoring should be developed.*
- *A form of BACI (before-and-after-control-impact) model should be developed for monitoring effects of compensation.*
- *Transferring responsibility for longer-term financing of compensation measures and monitoring during/midway project operation to environmental authorities is not in accordance with good practice. "This may happen when compensation areas are incorporated into a protected area managed by the environmental authorities. As per the polluter-pays principle as well as the Norwegian Nature Diversity Act, Section 11, the costs associated with prevention or mitigation of environmental damage should be covered by the project developer". (p.12)*
- *Measures at all levels of the mitigation hierarchy were implemented and this contributed to the achievement of no net loss, in particular measures that avoided or minimized certain impacts.* However, the limitations acknowledged due to lack of data to fully evaluate both the cumulative impacts of the new construction and the compensatory value of the new designated area, make this statement uncertain.
- *"The evaluation has not found indications that the ecosystems or ecosystem functions in the reserve and Ramsar Site have been significantly affected by the highway upgrading. The very limited post-construction monitoring and the short period after completion of construction mean there are uncertainties associated with these findings and further studies are recommended" (p 9).* Monitoring of impacts and effectiveness is important, but monitoring does not guarantee effective compensation and the achievement of NNL.
- *"It is important to recognize that the wetland ecosystem was heavily affected by human activities prior to protection of the wetland. The additional impacts from expansion of the existing road therefore appear to be limited and small by comparison to other factors*."(p 9) However, given the importance of the site, alternatives that included the avoidance of impacts, and possibility of the restoration of the condition of threatened habitats outside the protected area (off-site offsetting) as a measure to compensate for the new impacted area, would have been best practice options to be evaluated.

Given that this was a protected area with international conservation interests according to the guidelines from RAMSAR, the same model of project management and conservation plans has not been implemented in other offsetting projects from the transportation sector.

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NINA Report

*The Norwegian Institute for Nature Research, NINA,* *is as an independent foundation focusing on environmental research, emphasizing the interaction between human society, natural resources and biodiversity.*

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