

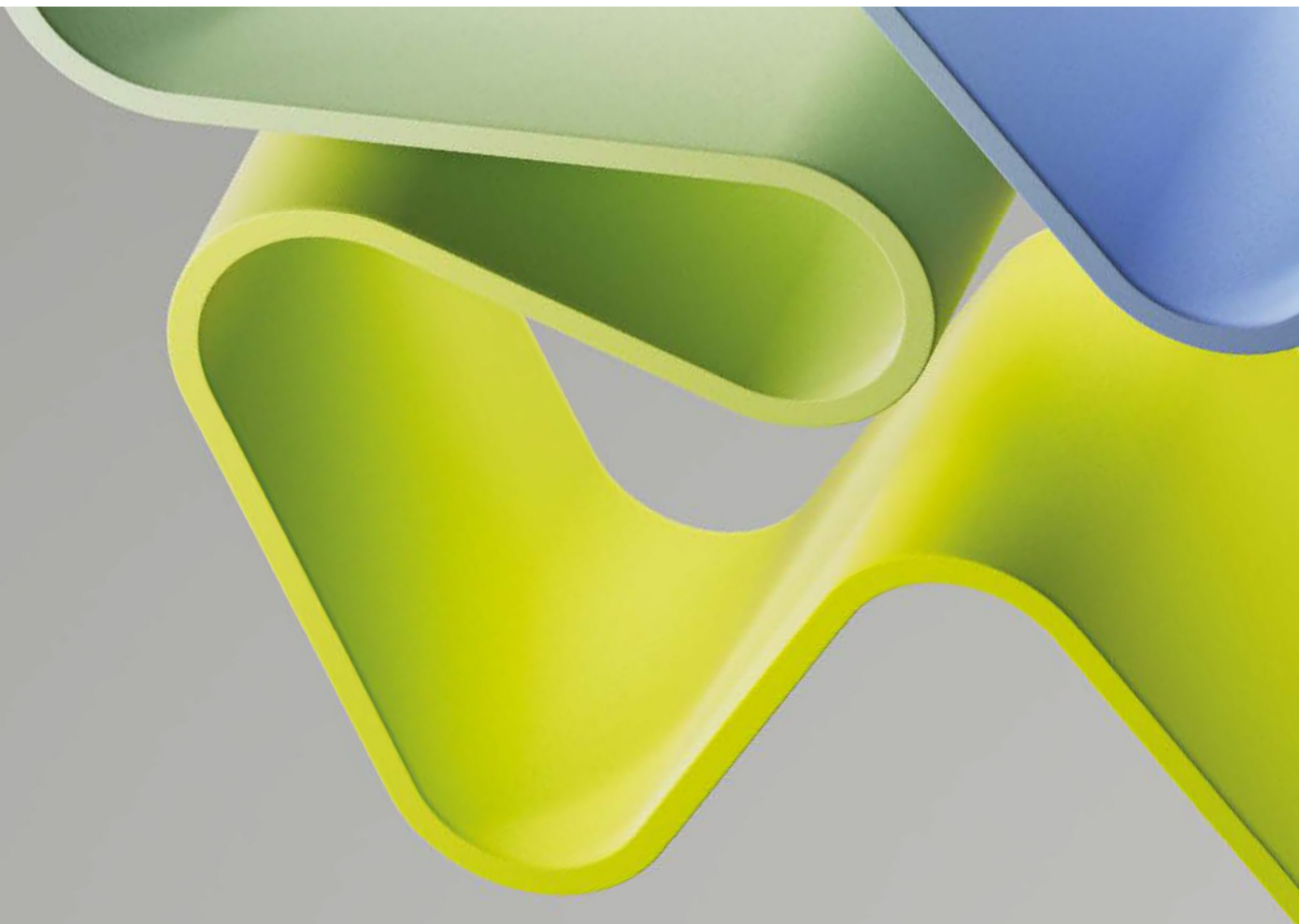
# **Evaluation of Natural Sciences 2022-2024**

## **Evaluation report**

### **Climate and Environment**

#### **Norwegian Research Centre AS (NORCE)**

January 2024



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## Statement from Evaluation Committee – Institute II

The members of this Evaluation Committee have evaluated the following administrative units at the research institutes within natural sciences in 2022-2023 and submitted a report for each administrative units:

- CICERO Centre for Climate Research
- Norwegian Meteorological Institute – Weather and Climate (MET)
- Norwegian Institute for Sustainability Research (NORSUS)
- Norwegian Research Centre (NORCE) – Climate and Environment
- Norwegian Institute for Air Research (NILU) – Environmental Chemistry Department
- Norwegian Institute for Air Research (NILU) – Atmospheric and Climate Research Department
- Norwegian Water Resources and Energy Directorate (NVE)
- Nansen Environmental and Remote Sensing Centre (NERSC)

The members of the Evaluation Committee are in collective agreement with the assessments, conclusions and recommendations presented in this report. None of the committee members has declared any conflict of interest.

The Evaluation Committee has consisted of the following members:

Professor **Mat Collins**, (Chair)

University of Exeter, United Kingdom

Professor **Dorthe Dahl-Jensen**,

Niels Bohr Institute, Denmark

Professor **Hayley Fowler**,

Newcastle University, United Kingdom

Professor **Martin Siegert**,

Imperial College London, United Kingdom

Professor **Thomas Jung**,

Alfred Wegener Institut, Germany

## Description of the administrative unit

NORCE Climate & Environment (C&E) is organised across 10 research groups that are gathered in three departments. In 2021, NORCE C&E reported 166 employees, including one Executive Vice President (EVP) and one deputy EVP, three senior vice presidents, 11 research directors, 19 chief scientists, 62 senior researchers, 24 researchers, 18 post-docs, six PhD scholars, five administrative staff, four chief engineers, seven senior engineers and five engineers.

The NORCE C&E division has three research departments which gather 10 research groups: Department of Biotechnology and Circular Economy (Research Groups: Industrial Biotechnology, Marine Biotechnology, and Genetechnology, Environment and Society); Department of Ocean and Environment (Research Groups: Fish Biology and Aquaculture, Marine Ecology, Molecular Ecology and Paleogenomics, Laboratory for Freshwater Ecology, and Inland Fisheries (LFI) and Ocean Observations); and Department of Climate Dynamics (Research Groups: Climate Forecasting Engine, Regional Climate, and Earth Systems).

In their self-assessment and in the overall NORCE *2022-2025 strategy*, NORCE C&E reports strategic goals that include: (1) developing innovative and sustainable solutions for major societal challenges, (2) providing relevant knowledge at various scales, internationally and globally, and (3) translating outcomes from research to impact. To maximise the synergies between the different purposes of the NORCE C&E Division, the departments and research groups are engaged in three cross-cutting research priority areas: (1) Sustainable Food and Feed, (2) Rivers, Coast and Fjord Systems, and (3) Climate and Environmental Research for Polar Regions. These have been developed in response to the NORCE strategy's objectives to prioritise societal and policy relevance, as well as to stimulate more direct collaboration with key industry and public stakeholders.

In their self-assessment, NORCE C&E reports that much of the innovation is performed through cocreation with industry partners. The results of the collaborations lead to shared ownership of potential products and services, and open access to new knowledge, through presentations, reports, and academic papers. In the self-assessment, NORCE C&E states that the division has a wide range of collaboration, through participation in centres, infrastructures, large initiatives, strategic cluster initiatives, and projects. For example, regional and national collaborations have been established through events such as the Klimathon and projects like Biosirkel and SFI Climate Futures.

In their self-assessment, NORCE C&E reports a number of strengths that include: (1) success in establishing a broad portfolio of international projects, including H2020 and Horizon Europe, (2) the formation of industrial partnerships with a wide range of Norwegian and international organisations, which include bilateral partnerships and collaboration in SFIs, and (3) a multidisciplinary research environment. However, they also report that significant overall revenue growth in the division in recent years has been achieved primarily through research contributions (funded by RCN and the European Commission). This has led to a lower percentage of commissioned research funded by industry and public sectors as a share of total revenue. Balancing the research portfolio is a current priority of the C&E Division. Finally, while repeated reorganisation processes up until 2021 have been time-consuming and given operational challenges for the whole company, the company and division structures and NORCE strategy have now settled into place.

## Overall assessment

NORCE is a large organisation, and its C&E division is also sizeable (166 staff). NORCE has recently reorganised, and the result is quite a complex arrangement of divisions, themes, teams, and projects. It took the evaluation committee some time to understand how NORCE worked.

NORCE's strategic plans are set out well, but KPIs are missing (to the evaluation committee) to evaluate performance and understand how decisions made have worked. This issue is equally important as we consider future decisions and developments. The evaluation committee also noted that the reorganisation of NORCE may have led to a legacy on strategic plans, embedded from the former structure.

The strengths of NORCE are in its interdisciplinarity, its EU-funding and relevance to society, while weaknesses involve a lack of industrial connection. Its opportunity is clearly within the growing environmental sector, and a threat relates to the geopolitical issues in the Arctic.

While the research of NORCE is judged well, on impact NORCE has struggled to convince the evaluation committee that it is operating at an equally high level. Much of the impact mentioned relates to activities rather than specific and tangible impacts, such as policy or economic growth. Going forward, NORCE is encouraged to consider tracking impact in a way that can be assessed quantitatively.

## Recommendations

In relation to NORCE's strategy, KPIs on each element would allow the organisation to understand how well it is functioning and track progress following strategic decisions.

Clarity of NORCE C&E versus the wider NORCE organisation would be good to see. C&E presently has a lot of operational and strategic freedom, but the evaluation committee believes there to be some benefits of closer working across the organisation (i.e. interdisciplinarity). It would also be good to understand where NORCE plans to be in 10 years.

The NorESM is a valuable element of NORCE's work, but the evaluation committee was missing the 'big research ideas' that such a facility can offer. The evaluation committee recommends a strategic analysis of how to deploy the model on matters that are most relevant to our future. The evaluation committee were also uncertain about the governance and leadership for NorESM, and clarity on this may help its longer-term development.

Give that NORCE has highlighted its Arctic work among its 'threats' following the SWOT analysis, a strategic plan for this work is needed, under a variety of scenarios.

The evaluation committee would like NORCE to be more strategic on EDI and track the measures it is putting in place to understand whether they are working or not.

On impact, NORCE produces good work, but it may need to reconsider what the 'impact' actually is. The outcomes of the 'impactful' work has not been explained. The evaluation committee recommends that NORCE quantifies its impact on climate policy, carbon reductions and economic development, and to measure and track the success of impact more thoroughly.

The table below presents the specific aspects of the evaluation the administrative unit requested the evaluation to explore and indicates where these are addressed in more detail in the subsequent report.

<b>Specific Request from the Unit's Terms of Reference</b>	<b>Where it is addressed in the report</b>
Assessment on the degree to which NORCE is in compliance with defined company objectives given the spread of geographic locations and the integration of a large variety of scientific competence and infrastructure.	Addressed throughout section 1.
Inter- and trans-disciplinarity in the research performed in the division and how this contributes to increased understanding addressing the grand societal challenges.	Addressed through the report and specifically in section 2.
The strategic use of internal funding (Strategic crosscutting activities on project, division and company level). These are meant to be seed funding responding to 1) Company overall strategy and 2) Strategic Areas within the Division Climate & Environment.	Addressed in section 1.2 and 1.3
How is NORCE's scientific integrity, branding and individuality are affected by partnerships in centres and networks.	Addressed in section 1.5, 1.5 and 4
Recent success in EU, as well as in the most recent Centre for Research- based innovation and value creation (e.g., Climate Futures) has built on a concept on engaging civil society organisations and end-users in co-design and cocreation processes to make research more user relevant.	Addressed in sections 1.4, 1.5 and 4
The transformation of the project portfolio from national to international, and from contribution research to more commissioned research.	Addressed in section 1.3and 1.5

## 1. Strategy, resources, and organisation of research

The evaluation committee recognised the level and quality of excellent work being undertaken at NORCE. Its self-assessment could have been aided by a presentation and analysis of annual keyperformance indicators matched against its institutional goals. This is one area that might be improved upon. The evaluation committee was struck at the complexity of the NORCE organisation and did not understand how well NORCE C&E is able to work with other sections. NORCE has only around 6% of base funding to support activities. While this is very small, the evaluation committee did not know whether this was a real problem or a measure of success because of grant awards. One of NORCE's major investments was to support the NorESM, but the evaluation committee would like to understand the major scientific and environmental questions that can now be asked as a result. Finally, while NORCE is functioning well as an organisation, some attention to EDI (in terms of tracking success) would be advised by the evaluation committee.

### 1.1 Research Strategy

NORCE's broad aim involves "developing innovative and sustainable solutions for major societal challenges". Its "goal is to provide relevant knowledge at various scales: internationally and globally, and that outcomes from research will impact governance of resources. This is particularly relevant

in fields such as green transition". It has four cross-cutting themes: (1) Sustainable Food and Feed, (2) Rivers, Coasts and Fjord Systems, (3) Climate and Environmental Research for Polar Regions, and (4) Climate and Environmental Service Co-Production for Increased Quality and Relevance.

It has **strengths** relating to EU-funding, **weaknesses** on industry links and RCN core funds (it is currently at 6%), **opportunities** given the growing interest in climate action, and **threats** relating to its quite complex reorganisation (a threat, surely, not weakness), and in the Arctic due to geopolitical/external changes.

NORCE's strategy is on research and its translation; innovation; commercialisation; and being a good employer. It has a strategic plan for each. While this is good to see, KPIs on each would allow the organisation to understand how well it is functioning and track progress following strategic decisions.

The evaluation committee noted the high level of thematic interdisciplinary work, but still thought more could be done in future, especially around emerging areas of climate and business and law.

## 1.2 Organisation of research

NORCE was founded in 2017, merging various companies and departments. In 2021 the structure was revised – moving six departments into three divisions, to promote interdisciplinarity and holistic approaches. NORCE Climate and Environment is one of these divisions. NORCE C&E has a new structure, strategy and action plan and is comprised of three new sections: 1. Earth Systems; 2. Ocean Observations; and 3 Regional Climate and Climate Service. The first thing to note is that the structure and organisation is very challenging to understand from an external perspective.

In 2021, NORCE C&E reported 166 employees. Hence NORCE C&E is big (compared with other research organisations), and fits within the overarching NORCE framework which has 800 staff. Given the size of the organisation, it is vital that NORCE's strategy is clear and relevant to both those outside and inside the organisation.

Clarity of NORCE C&E vs the wider NORCE organisation would be good to see – C&E presently has a lot of operational and strategic freedom, but there may be benefits from working closer across the organisation (i.e. interdisciplinarity). It would also be good to understand where NORCE plans to be in 10 years.

## 1.3 Research funding

NORCE is supported by RCN funds up to 6% of turnover and 94% from external funding. The evaluation committee does not know whether this is sustainable, an artefact of grant success or both. In many ways it is good to see a research unit function effectively with modest (by proportion) core support. But, if grant success reduces, it is unclear how NORCE is supported through leaner times. Any organisation relying on 94% 'competitively awarded grant-income' would be in a precarious position in terms of its assured outlook, and this may influence how staff consider it as a long-term employer.

## 1.4 Use of infrastructures

NORCE is connected to external organisations to promote exchange of information and to assist innovation. It is involved in several key infrastructure projects, including:

- NBioC – Norwegian Bioprocessing and Fermentakon Centre
- ICOS Norway – The Integrated Carbon Observing System Norway

- NORCE coordinates Norwegian Earth System Modelling (NorESM) Infrastructure project INES

The NorESM is good to see, but the evaluation committee was missing the 'big research ideas' that such a facility can offer.

## 1.5 National and international collaboration

NORCE is connected to and part of the Svalbard Integrated Arctic Earth Observing System. On its Arctic work, NORCE has identified an obvious threat concerning how the region develops because of Russian activities. A strategic view, such as scenario testing outcomes, may be wise.

NORCE seems to be connected to many initiatives in Norway and EU. This is very good to see and is a sign of a healthy and well-functioning research organisation. Clearly NORCE plays an important role in Norway's environmental research culture.

NORCE staff also contribute to the IPCC, and to government boards, and offers comments on government documents. These are signs of an organisation functioning well and being vital to those outside of it.

## 1.6 Research staff

In 2021, NORCE C&E reported 166 employees, including two Executive Vice President (EVP) and deputy EVP, three senior vice presidents, 11 research directors, 19 chief scientists, 62 senior researchers, 24 researchers, 18 post-docs, six PhD scholars, five administrative staff, four chief engineers, seven senior engineers and five engineers. The evaluation committee was supportive of the approach built by NORCE to support its staff.

## 2. Research production, quality and integrity

The evaluation committee noted that NORCE undertakes research at a high level that has relevance and impact nationally and, in some cases, internationally. For a young organisation this is impressive. Research, based on bibliometrics and the evaluation committee's expert opinion, was judged positively in each of the three themes, but with some recommendations relating to (1) being careful that the breadth of work doesn't dilute the main focus of the group, (2) that for the ESM better training is needed to ensure key skills are retained, and (3) societal impact, could be better defined and considered.

### 2.1 Research quality and integrity

The following three sections relate to Research Groups within NORCE C&E. They are followed by seven additional sections relating to the other groups within NORCE that lay predominantly within Life Sciences.

#### **Research group a overall assessment – Regional climate and climate services**

Over its relatively short lifespan, the group has grown substantially and has demonstrated excellence in its goals of bridging the gap between basic science tailoring climate information for practitioners to support end-user adaptation planning and action. The group's activities are well-targeted to match its research goals and the group produces high-quality research and they make substantial contributions to a variety of well-funded collaborative projects. Whilst there may



be cause for some fear that the wide variety of activities could dilute some of the strengths of the group in some areas, the evaluation committee was impressed that this does not seem to be the case as the group has produced excellent output in several quite disparate areas. Nonetheless, this should be something for the group to be careful of going forward as they themselves highlight in their self-assessment.

### **Research group b overall assessment – Earth systems**

Scores reflect a group who are doing well in their field but need to develop a clear research vision for the future. Strengths include a high level of technical competence in model development, a good level of funding and leadership in projects. The contribution to CMIP is a particular strength. Weaknesses include lack of training of the next generation and lack of a clear vision. ES model development is a highly technical activity and there is a danger that expertise gets lost when people leave or retire. The next generation need to be trained to take over.

### **Research group c Ocean Observations**

**Strengths:** Clear evidence for creativity and enthusiasm; Clear evidence of strategic thoughts and planning, in line with the benchmarks and with the institutional strategies; Good use of international network for enhancing funding track record; Willingness to enhance relevance for the host institution.

**Weaknesses:** Relevance of PhD-based research unclear, hence training and mentoring of students; insufficiently recognised; Gender equality and diversity insufficiently appreciated in the context of staff recruitment; Limited societal impact to date arising from the group's work.

### **Research group d Laboratory for freshwater Ecology and Inland fisheries (LFI)**

The group's environment was deemed to be adequate for supporting the production of excellent research, and as challenges associated with becoming an independent center are overcome there should be good potential for their organizational strengths to be developed further. The group plays an important role in freshwater ecosystem research and accordingly plays a considerable role in producing outputs that are internationally recognized, with a small number of higher ranked outputs. The group's contribution not societal development in Norway was considered to be considerable relative to other groups in the field, with clear examples of partner involvements in the research process. Particularly noteworthy was the group's work to create a traffic light system for future aquaculture developments, and their input to the creation of a UNESCO biosphere reserve in Norway.

### **Research group e Marine Ecology – MarEco**

The research accomplished by MarEco is of high quality, impact, and social relevance. The strengths are a diverse research profile and dynamic adoption of new topics, such as new emergent pollutants. This strategic move has been well justified, judging from the remarkable increase in funding. However, it also introduces the risk of less focus on traditional strengths, including advising the marine energy industry. A weakness is the limited engagement in PhD recruitment and supervision.

### **Research group f Gene Technology, Environment and Society (GEMS)**

The Gene Technology, Society and Environment group is performing research that can be recognised internationally as being good in terms of its originality and significance. It is a small group that has recently been formed and was merged with NORCE in 2021. The group is small and much smaller than previously due to reduced funding opportunities. The description of the group in the assessment report was particularly complicated and mainly focused on the history of the group, without describing sufficiently not only the future research direction of the group, but also how any future activities would be planned to ensure how their research would be implemented. The potential benefits of the interdisciplinary nature of the group needs to be maximised with a clearer strategic focus and some form of progress. The group appears to have access to good facilities including laboratories for wetlab research together with non-laboratory-based infrastructure such as library facilities, and IT support. The group has international links with research groups in Germany and South Africa. The societal contribution of the group is the group's strongest aspect and is particularly strong with respect to their research activities in the Responsible Research and Innovation (RRI) and Ethical, Legal and Social Aspects (ELSA) of scientific and technological developments

### **Research Group g Industrial Biotechnology (IB)**

The group is very well organised and clearly possesses the capacity to play a very important role in the Norwegian biotechnology landscape, both with respect to their competence in transferring processes to industry and their technical facilities in performing process scale up to the pilot scale. An important asset is that the Industrial Biotechnology group is hosting the Norwegian Centre for Bioprocessing & Fermentation which is an important infrastructure, and this will allow them to make a very positive contribution to the development of the Norwegian bioindustry sector.

Currently, the role of the societal partners in the research process is not well described in the information provided. Also, there was a lack of detail regarding outreach activities involving relevant stakeholders such as industry and the public sector. While activities being undertaken or being planned by the group, involving knowledge transfer were also not well addressed.

### **Research group h Integrative Fish Biology group (IFB)**

The IFB group at NORCE carries out research that is focussed on providing answers to improve the sustainability of salmon production by gaining knowledge in neurophysiology, endocrinology, and nutrition, with an emphasis on the parr smolt transformation. The group possesses some unique skills especially in neuro plasticity, where there are only very few groups world-wide examining this in production species of fish. There is significant support from NORCE, and investments have been made both for experimental labs and facilities. The group has grown quickly, but has changed names / identity many times, which makes the actual definition of the group slightly opaque. They have been extremely successful in gaining funding from a variety of different sources. The publication of scientific outputs is strong and disseminated in world leading journals. There are strong industrial links, but the role of the industrial partners is not clearly described in the assessment report. In addition, there is a lack of detail regarding how the research outputs are used by the industry, for example it is unclear what "SmoltVision" does and what is involved in the take up of the technology. The group has good international links and provides training to young scientists.

### **Research group i Marine Biotechnology**

The group describes the shift in their research focus in the last few years. In connection with their responsibility and connection to the national microalgae pilot infrastructure at Mongstad and the importance of the area to the circular economy for Norway in connection with the aquaculture and fishery industries, it seems logical that the group should focus on this direction in the future. This is documented by the many ongoing projects in this area, many resulting from funding acquired from EU sources. In relation to the national and EU based research funding the bilateral collaborations with Norwegian companies seem to be a little less than optimal and could be further developed to guarantee the optimal transfer of research results into the industry. The group needs to develop a critical mass of researchers if they are to continue to make advances in both of their targeted research areas, biocatalysts, and microalgae. They should be encouraged to continue to develop synergies with the aquaculture sector and entities within the bioeconomy, particularly in the marine area.

### **Research group j Molecular Ecology Research Group (MERG)**

The timing of the submission was not ideal. MERG was founded in 2010 but became MEP in January 2022 after members from the Ocean Observations Research Group. Consequently as of the time of reporting the two groups were separate entities and some of the report deals only with one or other of these groups.

This is a solid research group in rapid development with a clear strategy for its future, involving consolidating and stabilising and already has form. The group's success relies on long-term funding for basic research, but their expertise in baseline studies and monitoring could be in high demand as more focus is turned to the oceans for energy and resources, as climate threatens the high arctic and as over exploitation (as in fish farms) damages both product and the environment. Collaboration with UiB for infrastructure may also be at risk due to financing and space availability issues. However, NORCE is entering a consolidating period, which could provide MEP with continued long-term funding for unique paleogenomics research and the ability to participate in national and international research programs.

Despite their evident success, they have not yet delivered transformative research and it almost seems as if they need a master strategist to thread their data from experiment and environment together to tackle big questions with the resources.

## **2.2. Open Science**

On Open Science, NORCE points to a number of programmes (The European Open Science Cloud (EOSC)) and initiatives aligned with FAIR principles. It publishes in Open Access, makes codes available and ensures databases are open. NORCE is also involved in Citizen Science and co-creation ideas. The evaluation committee congratulates NORCE by considering what is 'best practice' on open access and acting accordingly.

## **3. Diversity and equality**

Regarding EDI, NORCE offers a well-considered paragraph on what is being done, but no evidence presented on how it has worked. NORCE has a good gender balance and is very international, where

60% of the staff are reported as international. A 10% post in HR is provided, which doesn't seem much, but supports an EDI committee. The evaluation committee would like NORCE to be more strategic on EDI and track the measures it is putting in place to understand if they are working.

NORCE C&E is quite international. It has a good approach to career development, such as the NORCE Academy, Young Research Forum, and a mentorship programme – all good to see and appreciated by the evaluation committee.

#### 4. Relevance to institutional and sectorial purposes

NORCE is doing a good job in terms of collaboration and service to the sector. It has yearly dialogue meetings with the Norwegian Environment Agency. In these meetings it informs the Agency about novel projects and findings from the project portfolio within sustainable use, the management of the environment and natural resources, the consequences of climate change and how we best can adapt to the change. While this is good to know, the evaluation committee were unclear as to what has resulted consequently.

On innovation, much of the innovation activity in NORCE is performed through collaboration with industry partners in the regular research and innovation projects managed by NORCE. Again, while this is good, the evaluation committee were unclear as to how much of these projects makes up NORCE business, and how vital it is to NORCE.

#### 5. Relevance to society

In their self-assessment, the NORCE C&E administrative unit states that they “mainly work towards the following SDGs: 3, 9, 13, 14, 15 and do ensure SDG 5 and 12 in our activities.”

NORCE is well connected to various organisations in relation to SDGs, but the evaluation committee would like to know some numeric and specifics (for example, economic impact, energy efficiencies, carbon reductions etc) to judge performance against targets. The evaluation committee was unable to judge how much impact any of the case studies has had.

NORCE is clearly having great impact in terms of its collaborations, but the outcomes could be communicated more effectively. This is especially the case if it wishes to distinguish itself from others.

#### **Comments to impact case 1 – Norwegian Bioprocessing and Fermentation Centre**

The Norwegian Bioprocessing and Fermentation Centre is a national centre and open research infrastructure for the development of new bioresources and bioproducts supporting Norway's strategy on the (bio) circular economy. NBioC is funded by the Research Council of Norway and NORCE is the host for the centre. The objective is the production of biomass for food/feed (including aquaculture feed), enzymes and biochemicals. It works to develop, optimise, scale-up and pilot the production of enzymes, protein and/or fatty acids rich biomass for the emerging bioeconomic value-chain on bioprocessing and fermentation. On Impact, NBioC has been involved in a number of projects, such as the H2020 PyroCO2 (2012-2026), SINTEF's Industrial Biotechnology (in which NORCE is a partner); and a Spin Off company Gas2Feed. These are sound areas of industry-related work, but the evaluation committee thought more emphasis on the economic/climate value could have been made.

### **Comments to impact case 2 – Capacity building in ODA countries**

Gene technology, Environment and Society (GEMS) activities were considered by the Norwegian authorities as an important contribution to the fulfilment of the obligations of the Cartagena Protocol under the Convention on Biological Diversity (2008-16). It is the national competence centre for biosafety. It has built skills around this area for Norway and internationally. On impact, it claims 500+ stakeholders, now working in key relevant areas; ODA related work; and contributions to biosafety. Since 2016, the network established has led to two bi-lateral projects, and an exchange programme. These are signs of a well-functioning programme, but the evaluation committee is missing key indicators on economic and climate impacts.

### **Comments to impact case 3 – climate futures**

The impact here refers to the development of climate forecasts on km-scales from 10 days to 10 years. These climate forecasts are tailor-made for businesses, governmental agencies, and local authorities within four broad themes: smart shipping, resilient societies, renewable energy, and sustainable food. The underpinning research related to business' climate needs. However, the impact story fails to explain what impact the work has had. The impact isn't the provision of climate forecasts – it must be the decision making, policy and economic/climate value of such work. This analysis is missing from the case study.

### **Comments to impact case 4 – Norwegian Climate Service Centre (NCCS)**

The NCCS has established a pathway between the science community and users, leading to national, regional, and local administrative units to help craft climate change adaptation policies and management plans, and consequently reduce the effects that ongoing and future climate change will have on nature and society. The NCCS is run by several Norwegian organisations, and mainly funded by the Norwegian environmental agency. While this is good to see, like with other impact cases the evaluation committee struggled to comprehend the 'impact' over the 'function' of the NCCS.

### **Comments to impact case 5 – Ocean acidification**

NORCE offers 'knowledge exchange' on ocean acidification through a biogeochemical observational programme. It claims members that are influential nationally and internationally. The underpinning research is excellent, and it has a long record of performance. On impact, however, the assessment claims that a knowledge gap has been closed but is unclear as to what effect this has had. The assessment details OA results, which is good but not an obvious impact outcome.

## List of research groups at the Administrative Unit

Institution	Administrative Unit	Research Groups
Norwegian Research Centre AS (NORCE)	Climate and Environment	Regional climate and climate services
		Earth systems
		Ocean Observations
		Laboratory for freshwater Ecology and Inland fisheries (LFI)
		Marine Ecology
		Gene Technology, Environment and Society (GEMS)
		Industrial Biotechnology (IB)
		Integrative Fish Biology group (IFB)
		Marine Biotechnology
		Molecular Ecology Research Group (MERG)

Department of Ocean and Environment (Research Groups: Fish Biology and Aquaculture, Marine Ecology, Molecular Ecology and Paleogenomics, Laboratory for Freshwater Ecology, and Inland Fisheries (LFI) and Ocean Observations); and Department of Climate Dynamics (Research Groups: Climate Forecasting Engine, Regional Climate, and Earth Systems)

## Methods and limitations Methods

The evaluation is based on documentary evidence and online interviews with the representatives of Administrative Unit.

The documentary inputs to the evaluation were:

- Evaluation Protocol (see appendix 3 Evaluation Protocol) that guided the process
- Terms of Reference
- Administrative Unit's self-assessment report
- Administrative Unit's impact cases
- Administrative Unit's research groups evaluation reports
- Bibliometric data
- Personnel and funding data
- Data from Norwegian student and teacher surveys

After the documentary review, the Committee held a meeting and discussed an initial assessment against the assessment criteria and defined questions for the interview with the Administrative Unit. The Committee shared the interview questions with the Administrative Unit two weeks before the interview.

Following the documentary review, the Committee interviewed the Administrative Unit in an hourlong virtual meeting to fact-check the Committee's understanding and refine perceptions. The Administrative Unit presented answers to the Committee's questions and addressed other follow-up questions.

After the online interview, the Committee attended the final meeting to review the initial assessment in light of the interview and make any final adjustments.

A one-page summary of the Administrative Unit was developed based on the information from the self-assessment, the research group assessment, and the interview. The Administrative Unit had the opportunity to fact-check this summary. The Administrative Unit approved the summary virtually without adjustments.

### **Limitations**

The Committee judged the information received through documentary inputs and the interview with the Administrative Unit sufficient to complete the evaluation.

## Appendices (link to website)

1. Description of the evaluation of EVALNAT
2. Invitation to the evaluation including address list
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4. Self-assessment administrative units
5. Grading scale for research groups

Website: <https://www.forskningsradet.no/tall-analyse/evalueringer/fag-tema/naturvitenskap/>



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