The Research Council of Norway

Evaluation of Mathematics, ICT and Technology 2023-2024

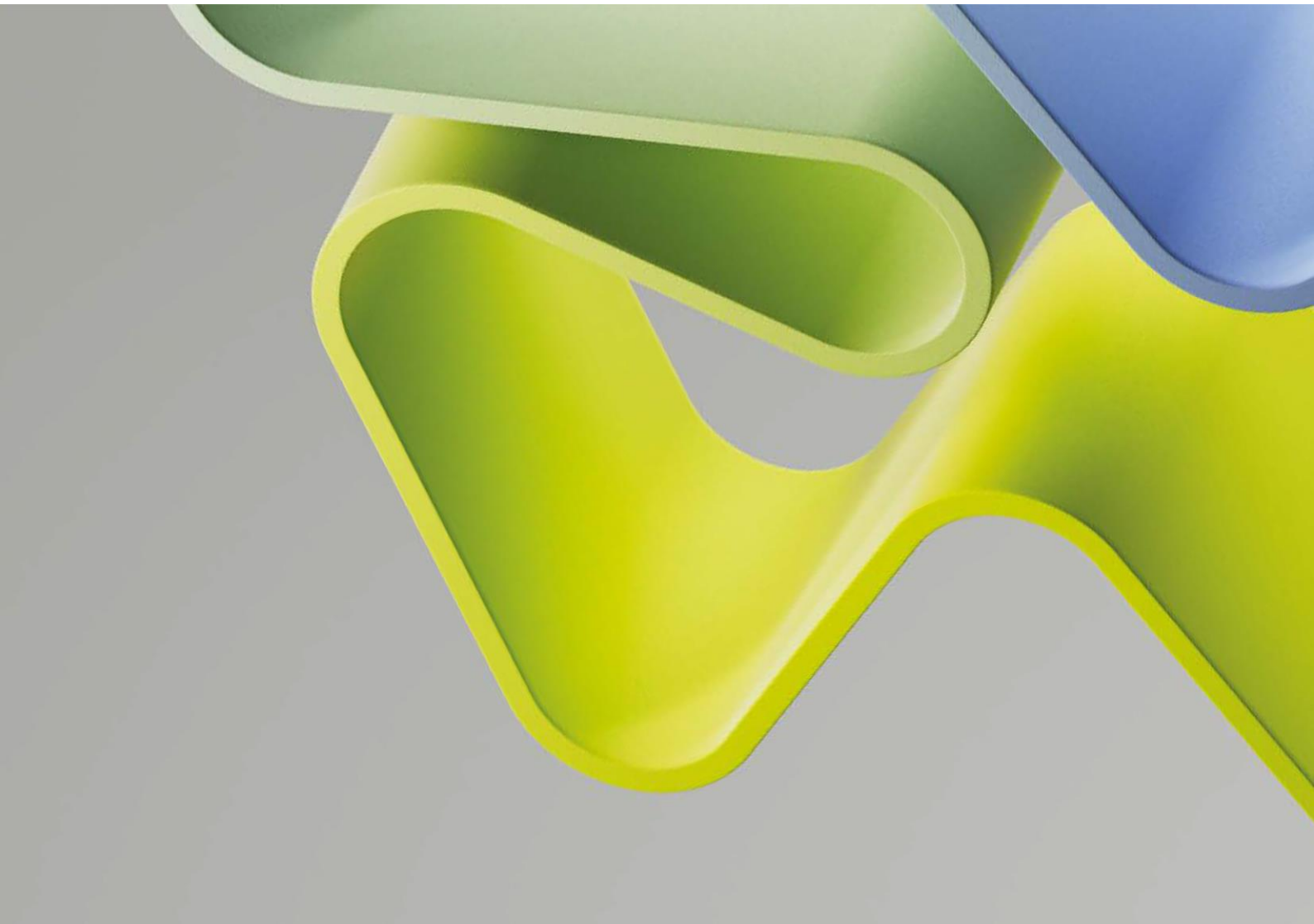
Evaluation Report for Administrative Unit

Administrative Unit: **SINTEF Community**

Institution: **SINTEF Community**

Evaluation Committee Institutes

December 2024



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Statement from Evaluation Committee Institutes

The members of this Evaluation Committee have evaluated the following administrative units at the research institutes within Mathematics, ICT and Technology 2023-2024 and has submitted a report for each administrative units:

- NORCE Energy and Technology, NORCE Norwegian Research Center (NORCE)
- SINTEF Community, SINTEF Community
- SINTEF Digital, SINTEF Digital
- SINTEF Industry, SINTEF Industry
- SINTEF Energy, SINTEF Energy
- SINTEF Ocean, SINTEF Ocean
- SINTEF Manufacturing, SINTEF Manufacturing
- Norwegian Computing Center (NR), Norwegian Computing Center (NR)
- Energy and Energy Technology (ENET), Institute for Energy Technology (IFE)
- Simula Research Laboratory (SIMULA), Simula Research Laboratory (SIMULA)
- Human and organisational factors (HOF), Institute for Energy Technology (IFE)

The conclusions and recommendations in this report are based on information from the administrative units (self-assessment), digital meetings with representatives from the administrative units, bibliometric analysis and personnel statistics from the Nordic Institute for Studies of Innovation, Research, and Education (NIFU) and Statistics Norway (SSB), and selected data from the National survey for academic staff in Norwegian higher education and the National student survey (NOKUT). The digital interviews took place in the autumn 2024.

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 consisted of the following members:

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Description of the Administrative Unit

SINTEF Community is a nonprofit research institute, one of six institutes within SINTEF. SINTEF Community is made up of five departments, each lead by a Research Director. Departments are further divided into groups, each headed by a Research Leader. As of 2022, SINTEF Community employed 302 staff, 225 of which were scientific research staff.

SINTEF Community consists of five departments, including four Research Departments and one department handling knowledge dissemination and product documentation. There are two research groups under evaluation, Climate adaptation of the built environment (CLIMADAPT) and Energy efficiency and flexibility in buildings and neighbourhoods (ENERFLEX).

SINTEF Community's focus is on the sustainable development of buildings, infrastructure and mobility, ultimately developing future solutions for the built environment. They aim to do this by becoming the leading research institute in their prioritised research areas: zero emission transportation, zero emission buildings, neighbourhoods and processes, energy efficiency and flexibility, circularity, resource and waste management, global sustainable development and climate positive actions. They aim to provide products and services to their customers through research-based consulting services, testing, certification, documentation and dissemination. They also identify six strategic goal areas in customers, co-creation, expertise, people, research infrastructure and effective operations. Each of these goal areas is associated with their own strategies and qualitative and quantitative performance metrics.

SINTEF Community follows the UN Sustainable Development Goals in guiding their research. These goals include the need for construction, infrastructure and mobility in a sustainable context. SINTEF Community manage key collaboration agreements with Statsbygg – the Norwegian government's building commissioner and Statens Vegvesen – the Norwegian Road Authorities. They also have continuous dialogue with the municipalities of many cities. They are also in constant interaction with other organisations in the sector through the hosting of research centres. This includes SFI-Climate 2050, which involved 15 companies and public agencies, and FME-ZEB (Zero Emission Buildings) with FME-ZEN (Zero Emission Neighbourhoods in Smart Cities) in which 45 companies and public agencies participated. They also develop and participate in several industry networks, such as the Network for Green Construction Center and the Constriction City Cluster in Oslo. In addition, they maintain a collaboration agreement with the Norwegian Green Building Council, which includes frequent meetings about development and possibilities for knowledge dissemination to the members of the council. With a high percentage of their funding coming from contract research, they maintain close ties with their private and public customers.

SINTEF Community's SWOT analysis highlights a number of strengths and opportunities that better position themselves in the future. They note their strong ability to make research-based knowledge directly available for industry, and their collaboration with joint strategic programmes and academic institutions such as NTNU. They also note the fact that they co-own and operate important national research infrastructure such as the ZEB Laboratory, Smart Building Hub and Climate Labs. They also acknowledge the fact that their prioritised research agenda is at the core of society's movement towards the green transition, and their mobilisation for the EU research agenda. In terms of potential weaknesses and threats, they note their lack of basic funding relative to similar research institutes in Europe, difficulty in running their laboratories and other research infrastructure with a financial surplus and limited funding for publishing. They also note that the building and construction industries are particularly sensitive to economic downturn, and a lack of research funding in the building, construction and mobility industries.

Overall Assessment

The evaluation committee finds the admin unit to be well organised and showing strong relevance for the society on different aspects of the built environment. The admin unit has close collaborations with industry and with authorities and regulators. The unit runs on a very project-based operational model with low basic funding, which can be challenging for securing adequate resources for staff development and training. However, the unit has well-established processes and lean practices which enable it to operate within its circumstances.

Although relatively small, the unit presents a rather complicated strategical structure with several overlapping targets, as well as a rather complex matrix organisation. There may be possibilities for streamlining. The unit has a strong position in the national ecosystem, but its presence at the EU level could be reinforced; this includes EU funding but also the use of EU networks.

The impact cases present strong evidence of effective collaborations with authorities leading to research being implemented as practical guidelines, also internationally.

Strengths:

- Close collaboration with industry, with a high share of industry-driven projects in portfolio, which is a clear indicator for significance to businesses.
- Close links with regulators and authorities, realised as research results taken to guidelines and standardisation.
- Good involvement in relevant research infrastructures.
- Good integrity of processes and guidelines applied, following high-level SINTEF alignments.
- Strong impact on society demonstrated.

Weaknesses:

- Strategy and self-assessment documentations are somewhat misaligned at some points.
- Role of digitalisation is not fully clear in the strategy.
- Strategy and organisational structure are overall complex and difficult to follow.
- Maintenance of strategic view as well as facilitating personal development and learning within rather short-term industry-driven projects can be challenging.
- Collaboration is very strongly around NTNU – could be beneficial to have more diversity, including collaboration with other SINTEF units.
- Personnel is quite senior, and recruitment of younger talent challenging.
- Low number of publications.

The Terms of Reference for the administrative unit is attached to the report.

Recommendations

Certain recommendations on how to improve the performance and develop research strategy are given here, with more detailed recommendations provided in individual chapters.

1) Consider simplifying the strategy structure to better match cross-cutting topics.
2) Ensure practical implementation of digitalisation throughout the strategy.
3) Promote more collaboration between the units, supported by organisational changes where needed.

4) Clarify the matrix organisation, especially for business lines.
5) Consider establishing more concrete actions towards EU funding.
6) Recognise the important role of EU-level networks and set a strategic action towards being part of suitable networks and becoming more integrated with them.
7) Include digitalisation aspects more clearly in the Lab of the future concept.
8) Extend research infrastructures on cyber-physical dimensions, for instance with digital twins and hardware-in-loop simulations.
9) Consider strengthening collaboration beyond NTNU.
10) Find synergies with other SINTEF units (Energy, Digital, Industry and others).
11) Develop more concrete plans for increasing the proportion of young researchers within the unit through recruitment.
12) Ensure adequate allocation of time for self-development, training, etc. within the project-oriented operation model.
13) Ensure attention on activating publications overall.
14) Find mechanisms for promoting joint publications also from industry-driven projects.

1. Strategy, Resources, and Organisation of Research

The unit's vision is stated as "We develop future solutions for the built environment." To achieve this, the unit conducts applied research and develops knowledge with and for the building, construction, infrastructure and mobility industries.

Two underlying grand challenges are said to be the climate transition and the protection of nature, but the strategy document provided as part of their self-assessment for the evaluation does not fully identify these challenges and does not make clear reference to them.

The unit especially addresses the building, construction and transportation sectors, which are evidently important for the transition. The chosen priorities follow this alignment, covering Architecture and area development, Building materials, Energy and zero-emission solutions, Future transport systems, Climate adaptation, Constructions, Emission-free construction and work sites, and Water.

The digitalisation dimension is properly identified in the strategy, but it is not fully present in the more detailed descriptions in the self-assessment provided.

Generally, many descriptions are not aligned between the self-assessment document and the strategy document. Terms and titles for challenges and priorities are different, for instance, which makes it challenging to assess.

1.1 Research Strategy

The stated six strategic goals include: Customers, Co-creation, Expertise, People, Research infrastructure, Effective operations. Dedicated strategy is presented for each of these goals.

Customer strategy presents good objectives but is rather generic. In particular, measures for transferring research results into customer value are not described. Moreover, the share of EU funding is considered under customer strategy. Maybe more typically EU could be considered under the Expertise and Research Infrastructure areas, where it would primarily

build competences which then could be further turned into benefits for customers, and under the Co-creation area for most of the Innovation Action projects within Horizon Europe.

Co-creation strategy recognises limited innovation actions by the unit and sets targets on improving this but does not specify any direct actions. Given the high share of customer projects, there should be a good basis for more co-creation actions through ecosystem-type working. EU projects are also valuable for co-creation and innovation. Collaboration with other SINTEF units appears to be quite low, and in particular there is much more collaboration with NTNU. In view of the focus areas, collaboration with SINTEF Energy and Digital would seem valuable. Interestingly, Energy is not mentioned as an anticipated innovation partner.

Expertise strategy defines targets for building academic excellence and expertise. The excellence is considered for instance through high-level publications, visibility at conferences and presence in international networks. Communication and dissemination are highlighted, and are important, but active participation in projects and initiatives that support the strategy could be highlighted more. The strategy raises a very relevant point: bringing social sciences into the picture will be crucial and is currently not addressed enough; this unit could take a strong role in this aspect.

People strategy defines common important targets for people development and well-being. Many important are objectives identified. The target of 70% researchers having a PhD is ambitious and relates to expertise strategy.

Research Infrastructure strategy focuses on development of infrastructure and laboratories for future. The “Lab of the Future” initiative seems very relevant, as cost allocation is always challenging. The infra strategy could be more detailed and could include certain additional factors: 1) Possibilities on co-creating, co-owning and co-using laboratories together with industry and/or universities and other SINTEF units. This could lead to synergies, reduce costs and improve co-creation possibilities. 2) Digital dimension: cyber-physical laboratories, digital twins and remote connections. These should be considered as future lab features that need to be built now.

Effective Operations strategy sets ambitious targets for safe and secure operations. The operational margin is set to average 5% over a 5-year period, with 4% of income to be invested in research facilities. HSE objectives are also included in the Operations strategy. The vision of supporting research-dependent industry towards better profitability is good.

Recommendations to the administrative unit.

- The structure of the strategy (following six goals) is difficult to follow, especially as many aspects crosscut all areas. For instance, internalisation, including EU, could deserve a dedicated approach. Consider different approaches for future strategy rounds.
- Highlight the practical implementation of digitalisation, which is currently little visible in the detailed strategy descriptions, although it is mentioned in high-level priorities.

1.2 Organisation of Research

Overall, research is properly organised and aligned. The structure applied is a matrix-type, where five substance-based departments have research groups below them, but at the same time the work is performed within four business lines which are based on different types of activities. Only two research groups are to be assessed now. The research is basically conducted within different project types, including normal projects, centres and

large projects, prioritised research areas (PRAs), strategic initiatives and business development activities. PRAs are stated to be cross-cutting priority projects that bring together departments and groups.

Four business lines focus on 1) Research and development, 2) Research-based consulting, 3) Product documentation and 4) Knowledge dissemination. Whereas the first business line is the core research which offers the knowledge, other business lines mostly harness this knowledge and reach out in different ways. The detailed organisations and practices for business lines are not presented in the self-assessment report.

Some parts are not fully clear from the descriptions provided in the self-assessment; for instance, knowledge dissemination is both a department and a business line. The roles and collaboration of these dimensions is not clear. The evaluation committee would therefore encourage the unit to consider how these lines add value to research activities and how collaboration takes place in reality.

Overall, the organisation structure seems bit complex given the size of the unit. Based on the information provided in the self-assessment, the evaluation committee sees an opportunity to increase the efficiency of the current structure of the unit for cross-cutting studies.

Recommendations to the administrative unit.

- Consider the efficiency of current structure for cross-cutting studies. Does the current structure push enough towards collaboration between departments? Are PRAs the main vehicle for cross-department collaboration, or does this also happen in other projects? Promote organic collaboration across organisation limits.
- Clarify the role and operation of business areas. How are they funded and operated? What are their practices in reality?

1.3 Research Funding

The admin unit has successfully secured funding from RCN, EU and private sources. On average, between 2018 and 2022, the unit has secured 100m NOK per year from industry sources for contract research. They also secured funding from RCN for innovation projects, around 20.8m NOK per year. The unit also receives around 98.9m NOK per year from national grants from RCN to deliver research centres and competence building projects amongst other things.

Between 2018 and 2022, the unit secured an average of 9.9m NOK per year from EU projects, though notably this has increased from 3.5m NOK in 2018 to 15.9m NOK in 2022. EU funding has been low for this unit, and although it has been increasing relatively fast, it remains low. The admin unit acknowledged this in their strategy, but no direct actions to improve the situation are indicated.

The basic funding of around 8% is quite low. The evaluation committee has concerns around how competence development and knowledge building can be assured with this basic funding. However, a significant share of the portfolio is publicly funded research projects, which should also allow competence-building following the project plans.

Recommendations to the administrative unit.

- Consider establishing more concrete actions towards EU funding, not only allocation of resources generally. For instance, setting responsible persons/roles, defining processes, etc.

- Recognise the important role of EU-level networks and set a strategic action to be part of suitable networks and become more integrated with them.

1.4 Research Infrastructure

The unit is involved in two national research infrastructures (ZEB Lab and Smart Building Hub), which seem more like living labs than actual laboratories. These infrastructures seem very relevant, addressing the interface of building and digital solutions, and providing data for further research. They are both in normal daily use, which makes them realistic environments. In addition, the unit has dedicated laboratories for different purposes, putting the unit in a unique position nationally. Many of the labs are co-owned with NTNU.

The admin unit's self-assessment report states that the laboratories are difficult to operate in a profitable manner, but the operational models or practices are not further elaborated. There is no indication of what kind of activities are conducted in the labs; whether they are only for research or whether they also serve industry for more testing-type activities.

A target of including digital e-infrastructure is mentioned in the self-assessment report, and this seems a promising direction for future development. The "lab of the future" approach also seems promising, although it seems to focus mostly on operational models and the overall economy of lab operations.

The unit is not involved in international research infrastructures like ESFRI-related EU developments. One recommendation is to consider becoming part of such large infrastructure initiatives.

Recommendations to administrative unit.

- Include digitalisation aspects more clearly in the Lab of the future concept.
- Extend research infrastructures on cyber-physical dimension, for instance with digital twins and hardware-in-loop simulations.
- Consider finding a role within ESFRIs and other EU-wide infrastructure initiatives

1.5 National and international collaboration

The unit has wide and ongoing collaborations with different sectors, including industry but also public sector, third sector, universities, research institutes and clusters. National collaboration seems more established, but international collaboration is stated to grow fast due to EU and international activities.

National collaboration is very strongly focused around NTNU. It is acknowledged that more collaboration with other universities should be developed, but collaboration with other SINTEF units seems very low, and some of them (especially Energy) are not even stated as collaborators. For instance, with an overview of publications: 304 joint publications are with NTNU between 2016-2020, whereas there are five publications with other SINTEF units between 2019-2020. Even if the timelines are not the same, the scales are totally different. The evaluation committee consider this to be an oversight and a lost opportunity to capitalise on the knowledge with SINTEF and within other national universities.

A good list of international collaborators is also presented. This is mostly through individual projects or networks, and does not indicate actual long-term relations, staff exchange, mutual strategies, etc.

Recommendations to administrative unit.

- Consider strengthening collaboration beyond NTNU.
- Find synergies with other SINTEF units (Energy, Digital, Industry).

1.6 Research staff

The unit has around 300 employees in total. A clear majority of them are research-focused: it seems that 90% of the staff are in research, with the remaining 10% in support functions. This is a very good ratio for a research institute.

The staff is rather senior (65% in senior positions), which could create challenges for the longer-term sustainability of the unit. One action can be to promote younger and early-career researchers. PhD is obtained by 45% of personnel, which is also good indicator among European research institutes. The admin unit have a plan to improve this further, which is a very good objective, and the admin unit should ensure they put in place a concrete plan to realise this objective in the coming years.

Gender balance is rather good again compared to the evaluation committee's experience and view of research institutes more generally. In the major research groups the share of women is almost one-half, which is commendable.

The researchers are stated to work 100% for research, which includes also supporting activities. Direct project work should cover two-thirds of this time. The actual time allocated for learning and development is not described in the self-assessment report. PhD programs are generally promoted, but it is unclear what possibilities are realistic for SINTEF Community staff. Visits and stays abroad should also happen within a project. Researcher mobility possibilities are described quite briefly and generally. A period abroad is a typical procedure for PhD programs, but here the supporting mechanisms are again not described.

Recommendations to the administrative unit

- Develop more concrete plans for increasing the proportion of young researchers within the unit through recruitment.
- Ensure an adequate allocation of time for self-development and training, etc., within the project-oriented operation model.

1.7 Open Science

The open science approach follows the SINTEF-level principles and corporate level Publications Policy and is sound and proper overall. The unit has shown very good development in its share of open-access publishing over recent years, with 78% of publications now open access.

At the same, the yearly average number of publications per person is low – 0.6 publications per person between 2020 and 2023 – and this needs attention. This is also noted by the admin unit itself. It is not clear from the self-assessment however, how the admin unit aims to reach their target of 1 publication point per person. The unit should therefore work with their research staff to define and implement a practical approach and requisite support for achieving this in a way that aligns with SINTEF's overall structure and processes.

Research data management follows general SINTEF-level principles, which the evaluation committee find to be appropriate and practical. This includes ensuring there is a data management plan for every project, and that all projects are implemented in line with FAIR principles.

Recommendations on how to promote open science

- Attention on increasing publication rate overall.
- Finding mechanisms for promoting joint publications also from industry-driven projects.

2. Research production, quality and integrity

The unit has defined five research departments, three core development areas and eight prioritised research areas (PRAs). There are no descriptions specific for these categories beyond their titles, so the relevance and quality of the unit's actual research activities are difficult to assess.

The self-assessment report makes reference to general policies but does not provide reflections on the quality of their research, or adequate details regarding their approach to research integrity or a research integrity policy.

2.1 Research quality and integrity

The analysis focuses on two research groups, ENERFLEX and CLIMADAPT. Across these two groups, there is a clear strength in performing internationally relevant cross-cutting research supported by up-to-date research infrastructures. Both groups have a strong collaboration with NTNU, which is identified as a strength especially for academic research projects, but also considered a challenge due to some overlapping and scientific excellence building issues as discussed below. Both groups present proper international peer-reviewed publications in their specific areas of energy efficiency/flexibility and climate adaptation.

Research group Energy efficiency and flexibility in buildings and neighbourhoods (ENERFLEX) overall assessment

ENERFLEX's strengths stem from a multitude of factors. It was initiated as a prioritised research area by its administrative unit, SINTEF, accomplished through a dedicated partnership with NTNU. By integrating research competencies and resources from diverse disciplines, ENERFLEX fosters inclusive academic environments and adopts a comprehensive approach to tackling various societal challenges. This focused organisational structure and commitment to research excellence boost competitiveness in obtaining research funds, developing and operating research infrastructure, and providing administrative and organisational support, all aiding in achieving the research area's goals. Confidence in the research area's accomplishments is strengthened by past successes such as the completion of the ZEB and ZEN programs, the presence of world-class research infrastructure, a substantial publication record in top-ranked journals and with high citation history, and skilled fundraising abilities. There is no doubt that this group has succeeded in conducting internationally recognised research and fostering innovative research environments. While the strong collaboration with NTNU is one of the research area's main strengths, it is also its weakness because it is not possible to distinguish how these two research environments complement each other in addressing the societal challenges. One would expect some difference due to the different societal roles of SINTEF and NTNU, which in the case of ENERFLEX is rather ambiguous, making it difficult to assess its strengths independently from NTNU. For instance, the report lacks internal goals and benchmarks, critical for demonstrating the group's ability to translate SINTEF's overarching goals into tangible objectives, performance metrics, utilisation criteria, and innovation potential. Of particular importance are the latter two aspects, vital for knowledge application and advancing research beyond current standards. While there is recognition of future financing

challenges, there's a notable absence of consideration for risks associated with unpredictable funding from EU projects.

Research group Climate adaptation of the built environment (CLIMADAPT) overall assessment

SINTEF is a project-based organisation not focusing on research in the same manner as universities, and it is thus difficult to assess in the same manner. Furthermore, whereas climate change is global, impacts are often regional and adaptation local, which makes climate change adaptation very much a local and national issue and applied adaptation research with direct societal impact thus often focuses on local problems and stakeholders; this makes internationally oriented research benchmarking more difficult, compared to classic scientific disciplines. The group's activities often lead to reports targeting Norwegian societal end-users, and to publications in recognised scientific peer-reviewed journals. Scientific publications coauthored with internal CLIMADAPT colleagues across disciplines seem to have lower priority. This may contribute to Norwegian society at large and the scientific excellence of other Norwegian research groups at universities including the long-term collaborator NTNU, rather than to the scientific excellence of this group. In the coming years the group is potentially facing a significant drop in external funding from RCN, which over the past years has covered about half of the group's budget. There seems to be no clear vision for what to do next.

3. Diversity and equality

The description of diversity and equality in the self-assessment information provided by the admin unit is rather short and limited. As no specific measures or actions are described, the evaluation committee cannot assess it. However, the unit makes clear reference to SINTEF-level policies and practices, which are surely up-to-date and well defined. The admin unit should ensure that corporate-level policies and practices are clearly implemented in their teams.

4. Relevance to institutional and sectorial purposes

The unit shows good activity for different sectors, especially for the public sector and authorities, as well as for different networks and ecosystems. Overall, a lot of presence in different networks is stated in their self-assessment report, but its actual relevance is challenging to assess. SMEs are well integrated into sectoral collaboration. There are not as many details regarding collaboration and relevance with industries and companies.

The unit shows good attention towards innovation and commercialisation, especially through the dedicated process that is applied for research projects. SINTEF-level collaboration has been taken to create processes and promote more efficient innovation. The Innovation Catalogue seems a very interesting development.

On the other hand, the involvement of individual researchers in innovation and commercialisation is not very clearly presented. Motivation and support for researchers is mostly around the process created, and does not consider, for instance, renumeration, value sharing, spin-off possibilities or similar mechanisms. Also, the support does not clearly indicate the allocation of time or funding for researchers to work on commercialisation of results.

5. Relevance to society

The unit shows strong interaction and dialogue with society, especially as an established expert for guidelines and recommendations implemented by national actors. The unit has a long tradition in consulting public stakeholders. Relevance to public and third sector organisations is obvious given the nature of the admin unit's areas of research, whereas relevance to business and industry sectors is perhaps less demonstrated.

The areas covered, as well as the impact cases included, offer a perfect match for many of the UN Sustainable Development Goals. While the majority of actions are naturally in Norway, there is also good development towards international projects with relevant application areas in developing countries and elsewhere globally.

Overall societal relevance is strong and focused on traditional means for support to different sectors. Stronger impact could possibly be achieved through improved commercialisation and innovation activities, supporting new business models and companies and thus indirectly supporting society as well.

5.1 Impact cases

Comments on impact case 1: The SINTEF Building Research Design Guides - BFS

The case presents efficient and organised dissemination of research results gathered over years within several research projects. The main innovation is in bringing the results into an online catalogue to curate the contents for the user. The research results have been turned into guidelines which serve practical needs better. The tool is also used for education.

The topics covered include zero energy buildings, energy-efficient buildings, climate adaptation, ventilation, indoor climate, etc. The database seems to be very wide and serves as a reference for planning and the building industries.

The unit has a defined process for taking research results into BFS. Authorities and standardisation organisations are involved.

The tool has a good position among different users, and it is also recommended by authorities. The case overall shows good development in bringing research results into practical information for everyday users, having significant relevance for society.

Comments on impact case 2: Resource Management in Low- and Middle-Income Countries (LMIC)

This case focuses on resource management research that this unit has been conducting in LMIC countries for a long time. The case presents the advancement of over 30 years research continuum into two concrete projects in India. Topics have included reusing marine plastic waste in different industries and improving recycling processes. Related pilots have been performed in India.

As is rightly stated, the impact is long-term and difficult to measure directly. It is however evident that such projects pave the way to improved sustainability in LMIC countries. The nature of bridging long-gathered research results into practical pilots in collaboration with local actors surely has good societal relevance.

The case is supported by extensive dissemination and communication within LMIC countries, including high-level meetings and visits to Norway for educational purposes. This case shows excellent activity on such communication of research outcomes. Value for instance for UN SDGs is very strong.

Comments to impact case 3: Zero-Emission and Energy Efficient Buildings

This case puts together research results on zero emission and energy efficient buildings over a continuum of several research projects. The research has been performed within two FME research centres.

The impact is further elaborated into three categories: 1) Defining and implementing ZEB and ZEN concepts, knowledge transfer, 2) Design guidelines, standardisation, regulations, and policy development, and 3) Enabling technologies for zero-emission and energy-efficient buildings.

For ZEB and ZEN concepts, the results have been used within several building pilots, common awareness has been raised and there has been close collaboration with different sectors within society. The overall impact is difficult to quantify, but the societal relevance is obvious.

For design guidelines, standardisation, regulations and policy development, several society-oriented activities have been taken. Recommendations have been provided, requirements have been set together with public sector, and planning tools have been provided. Inputs to standardisation and regulation have been provided based on research results. Contributions to policy development are also demonstrated.

For enabling technologies, the unit's laboratory has been supporting development of several new technologies into solutions. The unit has been also involved in building-level solutions, both for renovation and for new buildings in collaboration with industry and municipalities.

Overall, this case presents a combination of various relevant topics that are based on a long-lasting research track. Their societal relevance is granted, but the actual scale of impact is bit challenging to assess based on the information.

Comments to impact case 4: Traffic safety and security

This case presents research on traffic safety and security, focusing on tunnel safety and that of young road users. For tunnels, solutions for activating drivers in long monotonous tunnels, fire safety and emergency exits have been studied. The solutions have been used mostly in Norway but also internationally, for instance US and China. The solutions have been referenced in national guidelines in Norway and US, and implemented in China and Singapore, which shows good international relevance.

For young drivers, interesting research on how brain activation and risk-taking decisions are related has been conducted. Cross-cutting collaboration with cognitive research has been taken. Different methods have been used to study these issues in different projects, and some research focused on children and their attention has been undertaken. These are surely important topics in a societal sense. These results have been visible, for example providing the basis for a national safety campaign.

Overall, such results are important to raise common awareness and public debate, as well as to align long-term development. In this sense, they show clear societal relevance and impact, although the impact is challenging to quantify directly.

Comments to impact case 5: Climate adaption and nature-based solutions

The case considers usage of nature-based solutions (NBS) as a means for climate change adaption. This research topic is rather new at the unit when compared with other cases. Two research projects have been carried out, one focusing on risk reduction within buildings and infrastructure sectors, and another on concrete pavements for stormwater management.

The research has provided vital input for especially for the public sector through three mechanisms: 1) Knowledge transfer, 2) New guidelines and 3) New products and concepts. Knowledge transfer has supported municipalities on implementing NBS for managing climate change adaption. New guidelines have been established by municipalities and public organisations with the support of the unit. Several products and concepts have been taken into use by different actors, including for instance building companies.

Overall, the results indicate good value and relevance for society. The case indicates strong collaboration with public sector. Even though the research topic is rather fresh, some concrete actions have already been implemented by municipalities. The scale of the impact is challenging to assess, and it is likely that much more impact will be generated as the research continues and new spin-off projects appear.

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 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 (only for HEI's)

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 at least two weeks before the interview.

Following the documentary review, the Committee interviewed the Administrative Unit in an hour-long 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's evaluation reports, and the interview. The Administrative Unit had the opportunity to fact-check this summary. The Administrative Unit approved the summary with minor adjustments for clarity.

Limitations

The Committee judged that the Administrative Unit's self-assessment report was insufficient to assess all evaluation criteria fully, and some information gaps remained after the interview with the Administrative Unit. This related to areas or topics in which the admin unit is subject to corporate-level strategies and policies that were not provided or described in the self-assessment report, such as those for Diversity and Inclusion and Research Integrity.

List of administrative unit's research groups

Institution	Administrative Unit	Research Groups
SINTEF	SINTEF Community	Climate adaptation of the built environment (CLIMADAPT) Energy efficiency and flexibility in buildings and neighbourhoods (ENERFLEX)

Terms of Reference (ToR) for the administrative unit

The board of SINTEF mandates the evaluation committee appointed by the Research Council of Norway (RCN) to assess SINTEF Community based on the following Terms of Reference.

Assessment

You are asked to assess the organisation, quality and diversity of research conducted by SINTEF Community as well as its relevance to institutional and sectoral purposes, and to society at large. You should do so by judging the unit's performance based on the following five assessment criteria (a. to e.). Be sure to take current international trends and developments in science and society into account in your analysis.

a) Strategy, resources and organisation

b) Research production, quality and integrity

c) Diversity and equality

d) Relevance to institutional and sectoral purposes

e) Relevance to society

For a description of these criteria, see Chapter 2 of the mathematics, ICT and technology evaluation protocol. Please provide a written assessment for each of the five criteria. Please also provide recommendations for improvement. We ask you to pay special attention to the following two aspects in your assessment:

1. Research infrastructure and laboratories (physical and digital)
2. Knowledge dissemination (i.e. "Byggforskserien")

In addition, we would like your report to provide a qualitative assessment of SINTEF Community as a whole in relation to its strategic targets. The committee assesses the strategy that the administrative unit intends to pursue in the years ahead and the extent to which it will be capable of meeting its targets for research and society during this period based on available resources and competence. The committee is also invited to make recommendations concerning these two subjects. 2

Documentation

The necessary documentation will be made available by the mathematics, ICT and technology secretariat at Technopolis Group.

The documents will include the following:

- a report on research personnel and publications within mathematics, ICT and technology commissioned by RCN
- a self-assessment based on a template provided by the mathematics, ICT and technology secretariat
- SINTEF Community Strategy 2022 - 2030

Interviews with representatives from the evaluated units

Interviews with the SINTEF Community will be organised by the evaluation secretariat. Such interviews can be organised as a site visit, in another specified location in Norway or as a video conference.

Statement on impartiality and confidence

The assessment should be carried out in accordance with the *Regulations on Impartiality and Confidence in the Research Council of Norway*. A statement on the impartiality of the committee members has been recorded by the RCN as a part of the appointment process. The impartiality and confidence of committee and panel members should be confirmed when evaluation data from SINTEF Community are made available to the committee and the panels, and before any assessments are made based on these data. The RCN should be notified if questions concerning impartiality and confidence are raised by committee members during the evaluation process.

Assessment report We ask you to report your findings in an assessment report drawn up in accordance with a format specified by the mathematics, ICT and technology secretariat. The committee may suggest adjustments to this format at its first meeting. A draft report should be sent to SINTEF Community and RCT]. SINTEF Community should be allowed to check the report for factual inaccuracies; if such inaccuracies are found, they should be reported to the mathematics, ICT and technology secretariat within the deadline given by the secretariat. After the committee has made the amendments judged necessary, a corrected version of the assessment report should be sent to the board of SINTEF Community and the RCN no later than two weeks after all feedback on inaccuracies has been received from SINTEF Community.

Appendices

1. Description of the evaluation of EVALMIT
2. Invitation letter to the administrative unit including address list
3. Evaluation protocol
4. Template of self-assessment for administrative unit (short-version)

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