

## **Investigation of how the CEC's activities related to the coordination of major research programmes and multidisciplinary collaboration platforms can be organised if the departmental structure changes**

### **Summary**

The investigation has studied how the activities of the Centre for Environmental and Climate Science (CEC) related to the coordination of major research programmes and interdisciplinary collaboration platforms should be organised if the research and education in the environmental and climate field currently conducted within CEC is coordinated and organised within a single institution that also includes the Department of Physical Geography and Ecosystem Science (INES) and the Department of Geology. The investigation has focused on the possibilities of initiating, facilitating and conducting inter- and transdisciplinary research, collaboration and communication in the field of environment and climate. In line with the boundaries set for the investigation, implications for education have not been assessed. The study includes implications for matrix organisations coordinated from CEC: the ClimBioSiS profile area, the BECC and MERGE strategic research areas, the LU Land collaborative initiative, the Sustainability Forum, the ClimBEco and Agenda 2030 graduate schools, and the Marine Centre.

The investigation has been based on a combination of studies of documentation, meetings with staff and partners, and comparative observations of similar organisations nationally and internationally.

CEC is today the Environmental Science Department of the Faculty, which also coordinates a number of matrix activities. The core of the activities is a mandate from the faculty to be a research actor, coordinator, meeting place, node for competence supply, and a knowledge bank and arena for collaboration in the environmental and climate field. The activities are thus based on *working with matrix organisations from an interdisciplinary and transdisciplinary core*, where the core activities funded by the faculty and the matrix activities funded in a special order have developed synergistically.

Core activities have provided opportunities for initiatives and continuity, while matrix activities have widened networks and brought in resources. However, this has not been

without difficulties, partly due to the organisational complexity created by the form of organisation.

The study examined how two alternative organisational forms, the **centre** and the **network organisation**, would relate to a number of critical success criteria. We have defined the difference between a centre and a network organisation as follows: a centre has a clear mission to initiate, facilitate and conduct inter- and transdisciplinary activities, to which academic staff are attached to lead and conduct research and collaboration. It also has an overall administration that coordinates and supports matrix activities. A network organisation does not carry out research and has at its core a professional organisation to support the activities of the constituent matrix organisations.

The criteria against which the organisational forms were assessed were: *legitimacy*, *leadership*, *incentives*, *administrative competence* and *attractiveness*. The study considered that a future organisation would need to be relatively independent and have its own visibility in order to create legitimacy. This is achieved by being led by a board of directors representing different parts of the stakeholders of the activity, and by having access to allocated funds. The organisational location of the activity is considered to be of less importance. Whatever the organisational form, the activities should be physically co-located to provide an interdisciplinary environment for meetings between researchers and to constitute a sustainable workplace with redundancy in the administration of inter- and transdisciplinary activities, including the matrix activities.

The assessment of the inquiry is that it requires an organisation with long-term financial as well as organisational muscle – which allows a high ambition to dynamically develop strategic research and collaborative initiatives, including coordinating existing and initiating new matrix activities – to support excellent research with measurable impact on society, in line with international and national research policy direction from the EU and Swedish government, ministries and state funders. A strong organisation and resource base will allow for long-term business development that is attractive enough to engage senior researchers from both the Faculty of Science and the rest of the University, and will allow for the recruitment of researchers to develop interdisciplinary research and collaboration. According to the study, this strongly suggests a centre with the possibility of attracting long-term researchers/teachers to develop both research and collaboration together with collaborating departments.

The ability to associate part-time teachers/researchers in varying degrees depending on the assignment is crucial.

The conditions for the centre's activities will be strongly influenced by whether or not the educational programme in environmental science is linked to it.

The study has not investigated possible consequences for education of different ways of organising the activities. If environmental science education is not located at the Centre, the Centre needs to have sufficient other mechanisms that create incentives for

researchers/teachers from different disciplines to participate in the activities. This could include funds temporary association of researchers, PhD/post-doctoral programmes, opportunities to develop interdisciplinary research projects, support in terms of collaboration and communication, etc.

The investigation also sees the possibility of creating a network organisation, which should then have a broad mission to facilitate interdisciplinary research, collaboration and communication. The core of such an activity will be existing matrix organisations at the intersections of climate, ecosystems, and society. The investigation sees a risk that a network organisation will reduce the incentive and ability to retain existing and develop new interdisciplinary initiatives that are not associated with this area. A network organisation also cannot serve as a legitimate platform to host faculty and department-wide research projects. Finally, the study identifies a risk that the supporting activities no longer have the same contact with interdisciplinary research, which may make the workplace less attractive for administrators with special skills to support interdisciplinary and transdisciplinary activities.

The conclusion of the study is that the faculty has the opportunity primarily to create a powerful *centre for inter- and transdisciplinary research, collaboration and communication in the field of environment and climate*. A clear scientific identity can be created from a natural science perspective on the subject of environmental research, where the earth's resources and capacity to assimilate human impact sets limits to existence, and which links to other sciences to address the global goals of Agenda 2030 and the Swedish environmental quality goals. In this way, researchers from the different departments of the faculty, as well as researchers from other faculties, can be engaged in the activities with appropriate association mechanisms. Such a centre will thus be an instrument to live up to the LU Sustainable Development Strategy 2019–2026 and its emphasis on cross-disciplinary collaboration to contribute to sustainable development.

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## Commission and mission statement

### Mission

The Dean of the Faculty of Science commissioned the Chair of the Board of the Centre for Environmental and Climate Science (CEC) at the Faculty of Science on 2022-02-22 to investigate how CEC's activities related to the coordination of major research programmes and interdisciplinary collaboration platforms should be organised if the research and education in the field of environment and climate that is currently conducted within CEC is coordinated and organised within a single institution that also includes the activities of the Department of Physical Geography and Ecosystem Science (INES) and the Department of Geology<sup>1</sup>. The commission included the following

*“analyse how such an organisational change affects the possibilities of conducting departmental and faculty-wide coordination and coordination of research, collaboration and education in the field of climate and environment”*

The investigation was to make proposals as to which of the above functions

*“can be organisationally integrated into a larger institution and which should be placed in a separate entity, such as a centre formation”*

The assignment states that the investigation should also consider how similar activities are organised within Lund University, elsewhere in Sweden and in other countries.

Proposals would be given on

*“how the part of CEC's activities related to interdisciplinary collaboration platforms/networks and coordination of major research programmes in the field of climate and sustainability can be operated and organised in the formation of a larger, joint institution with CEC, Geology and INES”.*

*“how CEC's role as host of the strategic research areas BECC and MERGE can be organised to contribute to the implementation of Lund University's strategy for strategic research areas”.*

At the same time, the Dean commissioned external experts to “analyse, on the basis of existing activities within CEC, INES and Geology, how research within these units can be coordinated and organised within a joint institution in a 3-5 year perspective, and how the environment, climate and geology area at the Faculty of Science can thereby be profiled more clearly”<sup>2</sup> (the “CIG investigation”). The investigation into the CEC centre function will “take into account the proposals from this investigation concerning the change in organisation and location of research and teaching within the current CEC, INES and Geology.”

In accordance with the Dean's decision<sup>3</sup>, the investigation was carried out by CEC's Chairman Henrik Smith with the support of CEC's Research Coordinator Marianne Hall.

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<sup>1</sup> STYR 2022/291

<sup>2</sup> STYR 2022/292 with revised decision 2022-04-19 STYR 2022/966

<sup>3</sup> STYR 2022/1289

The final report was submitted to the Dean of the Faculty of Science on 14 November 2022.

### Interpretation of the mission

According to the decision of the Science Faculty Board<sup>4</sup>, the CEC has a mission of a centre nature, by being:

- a research actor that, in close cooperation with other institutions, stimulates and conducts environmental and climate research with a broad and interdisciplinary profile,
- a coordinator for strategic environmental and climate science research and infrastructure initiatives,
- a dynamic and creative meeting place for researchers who want to tackle today's and tomorrow's environmental and climate challenges that require a broad approach,
- a node for the provision of skills through the training of tomorrow's professionals in environmental and climate science and,
- a knowledge bank and arena for active interaction between academia and society.

The investigation includes those parts of the activities that have a centre character, i.e. involve initiating, managing and conducting interdisciplinary research in collaboration with other institutions and working broadly on collaboration and research communication that builds on and works towards a broader research base than that physically present at CEC (henceforth *CEC's interdepartmental and inter-faculty activities*). Furthermore, the study concerns the networks coordinated from the *CEC* (hereafter *CEC matrix organisations*, Annex 3), which has been interpreted as<sup>5</sup>:

- **CEC's cross-departmental and cross-faculty activities** in interdisciplinary research, collaboration and communication
- **BECC** (Biodiversity and Ecosystem services in a Changing Climate) - strategic research area
- **MERGE** (Modelling the Regional and Global Earth system) - strategic research area
- **ClimBioSiS** (Sustainable solutions in the climate change - biodiversity - social nexus), profile area at Lund University

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<sup>4</sup> STYR 2020/1222, effective from 2021-01-01

<sup>5</sup> Based on clarifications in the relevant studies, the following were identified as relevant: the strategic research areas BECC and MERGE, the EIT Climate-KIC office at Lund University Climate-KIC@lu, the collaborative platforms LU Land and the Sustainability Forum.

In addition, we identified the Maritime Centre in Simrishamn. We also considered the ClimBEco (linked to BECC and MERGE) and Agenda 2030 (linked to the Sustainability Forum) research schools. The Bioeconomy graduate school is linked to CEC's core activities rather than to the matrix activities and has therefore not been included. During the course of the study, five new profile areas were established at Lund University, one of which, ClimBioSiS, has been located at CEC and is therefore considered. During the course of the study, Climate-KIC@lu was organisationally transferred to the LU Cooperation office of the Research, Collaboration and Innovation Section, and was therefore discontinued. The ICOS research infrastructure is not included in this study according to the terms of reference, but is being investigated within the CIG study

- **Marine Centre in Simrishamn** - research/education/collaboration centre owned by the Municipality of Simrishamn, where Lund University through CEC coordinates and initiates research
- **LU Land** - strategic collaboration initiative at Lund University
- **Sustainability Forum with the Graduate School Agenda 2030** - Lund University's joint umbrella organisation for strategic support and coordination of sustainability issues
- **ClimBEco** (Climate, Biodiversity and Ecosystem services in a changing world) - research school linked to BECC and MERGE, but with a broader mission

From the terms of reference, we identified two overarching questions to meet the purpose and intent of the terms of reference:

1. What objectives for trans- and interdisciplinary research development and collaboration are possible for a new organisation?
2. What functions will a future organisation need to have to fulfil these objectives?

To these are added three follow-up questions:

- a) What is required for a research-oriented activity at a university, which is not an institution, to be sustainable as an organisation and as a workplace?
- b) How can the organisation contribute to the implementation of Lund University's strategy for strategic research areas and ambition in terms of profile areas, and how does this relate to the new CIG department's area of responsibility?
- c) What barriers to collaboration and cooperation across departmental and faculty boundaries are inherent in different organisational structures and what mechanisms can overcome them?

## Boundaries

During the course of the investigation, the faculty clarified that the investigation of the placement and management of environmental science education at the undergraduate to postgraduate level is not included in the assignment. This implies some limitations, as both undergraduate and postgraduate education have a network character and thus an impact on other centre functions.

The study has not investigated the need for financial resources for future operations. Our assessment is that such an investigation must be carried out in an integrated manner for the two investigations in question, and in the light of other current organisational changes at the faculty and LTH. The activities are expected to continue to be largely financed by external grants.

## Method

The five issues identified above have been the basis for the analysis and determined the methodology and implementation.

The investigation has taken into account the RQ20 evaluation, relevant governance documents and previous reviews of the business, which are listed in Appendix 1.

Central to the investigation have been group meetings with *CEC staff* (core operations and matrix organisations)<sup>6</sup>, as well as meetings and discussions with partners and stakeholders affected by CEC's activities.

A total of 22 meetings and progress reports have been carried out, with CEC management, staff from all staff categories, representatives from all matrix activities, and partners across LU, including heads of INES, Geology, Biology, Physics and Chemistry (listed in Appendix 2). The purpose of the meetings was to gather experience from the CEC activities on what works and what could be improved, and to discuss with partners how different organisational forms would affect continued collaboration.

The study was carried out in consultation with a reference group consisting of the CEC Board and was on the agenda of all Board meetings during the course of the study. The progress of the investigation was reported and discussed in more detail on three occasions (Annex 2). The progress of the investigation was reported to Vice Dean Anders Tunlid on an ongoing basis, as mandated.

A survey was carried out of activities with similar missions at Lund University, supplemented by an analysis of the surrounding world to identify inspiring examples of organisations and activities at universities and research institutes in Sweden, Europe and the USA<sup>7</sup>. The aim of the survey and the analysis of the surrounding world has been to gather inspiration and lessons from the way other activities are run: purpose, goals, activities and organisation, as well as the functions that exist at the organisations to enable the activities.

Some activities with high visibility, good reputation and proven sustainability were selected as examples, in order to: 1) represent different possible directions for a future activity – focus on research or collaboration, or a combination of these, and 2) represent different forms and ways of organising and conducting activities.

## Present situation

### **The environmental science research and education subject**

Environmental science is an interdisciplinary field of education and research that brings together a number of natural science disciplines – including biology, ecology, physics, chemistry, and earth sciences – to address issues related to human impacts on the environment: in the atmosphere, hydrosphere, cryosphere, terrestrial, limnic,

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<sup>6</sup> All CEC staff have been invited to meetings in various constellations.

<sup>7</sup> At LU: LINXS Institute of advanced neutron and x-ray science (Department of Chemistry), Pufendorf Institute (University's special activities), AgriFood economics centre (SLU and School of Economics, LU), GIS Centre (INES), Lund University Centre for Sustainability Studies (LUCSUS) and International Institute for the Environment (IIIEE). In the rest of Sweden: Gothenburg Centre for Sustainable Development, GMV (University of Gothenburg and Chalmers University of Technology), Baltic Sea Centre (Faculty of Science, Stockholm University), Umeå Plant Science Centre (Umeå University and SLU). International: Stanford Woods Institute for the Environment (since September 2022 incorporated into Stanford Doerr School of Sustainability), Research and Transfer Center Sustainable Development and Climate Change Management at Hochschule für Angewandte Wissenschaften (HAW) Hamburg, and International Institute for Applied Systems Analysis (IIASA).

marine, and urban environments. In order to understand, analyse and propose solutions to risks and challenges related to land use and exploitation of natural resources of all kinds, as well as the release of environmentally harmful substances from anthropogenic activities, environmental science is fundamentally an interdisciplinary and transdisciplinary research subject which, to be comprehensive as a research and education subject, requires interdisciplinary approaches involving the research disciplines of the social sciences, engineering, humanities, medicine, law and arts faculties<sup>8</sup>. Environmental science often works in close collaboration with various societal actors, public stakeholders at local, regional, national, and international level, private industry and civil society, both in problem formulation and in the creation of knowledge to underpin society's environmental and climate work. Environmental science is a quantitative science with qualitative elements, which develops its own methods, theories and approaches to develop and conduct socially relevant education and research and prepares environmental scientists for the tasks they face in practice. Environmental scientists have knowledge of the causes of environmental problems in nature and of the social systems built to deal with them.

Environmental scientists are trained as problem solvers to ensure that environmental problems do not become issues that fall between disciplines or between societal actors.

### **CEC's departmental and faculty-wide activities**

CEC initiates, develops and conducts environmental science research, but this does not include all aspects of the environmental science research topic. The current focus of CEC can be explained by historical reasons, including the fact that ambitions to develop research have been influenced by the interest and competence of the available staff and the profile of the resources that have been available.

The CEC originates from the establishment of the Environmental Science major at the Faculty of Science in 1998. Environmental Science emerged as an academic discipline to address issues at the interface of traditional academic disciplines in order to understand the causes, consequences and solutions to human-induced environmental problems. 2004 saw the creation of the Department of Environmental Science.

In 2010, the Centre for Environmental and Climate Research (CEC) was established by incorporating both the education and the strategic research areas BECC and MERGE into a new centre at the Faculty of Science, and faculty resources were allocated to carry out the mission.

The CEC's mission thus included interdisciplinary activities based on collaboration across departmental and faculty boundaries and with societal actors. Cross-fertilisation successes in externally funded research and increasing responsibility for faculty- and

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<sup>8</sup> Internationally, a distinction is sometimes made between "Environmental Science", which is science-oriented, and "Environmental Studies", which clearly includes the link between humans and the environment and thus social science aspects (Encyclopedia Britannica). In Sweden, the scientific focus of Environmental Science varies, but usually has a natural science base and an interdisciplinary approach (Högskoleverket 2003). (Link for reference: <https://docplayer.se/5551663-Utvardering-av-utbildningar-i-miljovetenskap-miljoteknik-och-miljo-och-halsoskydd-vid-svenska-universitet-och-hogskolor.html>)

university-wide initiatives have led to an expansion of CEC's activities. To clarify its role as both an actor and a strong networking organisation, the mission was renewed in 2020<sup>9</sup>, and the name was changed to the Centre for Environmental and Climate Science.

The development of CEC as an organisation and of Environmental Science as a research and education subject has from the outset been based on a clear vision: *To create excellent and socially relevant environmental science research and education from a core of interdisciplinary competence underpinned by a network of researchers in traditional subject departments across the University, and with a high degree of interaction with the wider community.* CEC has worked from the outset on the basic assumption that the development of excellent research and education in environmental science requires the development of both basic and applied research, and that the researchers involved are rooted in their respective disciplines but develop interdisciplinary skills within the framework of the environmental science research theme. The approach to achieve this has been to combine some academic staff attached to the CEC with responsibility for leading the development of the interdisciplinary research subject, with structures that engage researchers/teachers from departments across the University to participate in the development of education and research. Through the education, teachers have been linked to the activity in various forms including accounting of staff and the internal purchase of teaching. In terms of research, these mechanisms have included both incentives in the form of support for research development and collaboration, and direct funding mechanisms such as funding for PhD studentships and research projects (the latter not least through the associated SFOs).

This has been facilitated by a multi-departmental college<sup>10</sup> (formerly referred to as track or function managers) partly accounted at CEC to run the development of the environmental science education and research subject and strengthen collaboration, and by the CEC Fellows<sup>11</sup> network.

From this base – CEC's interdepartmental and inter-faculty activities – a number of platforms for research, collaboration and graduate schools, and interdisciplinary research projects, research programmes and research environments have been initiated or associated. The CEC of today is the fruit of the continuity of CEC's interdepartmental and inter-faculty activities that has allowed for a dynamic development, fertilised by the broad and more flexible network within and beyond the University. This has provided the CEC with a combination of longevity and stability, and dynamic development that has enabled the CEC not only to maintain its relevance but

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<sup>9</sup> STYR 2020/1222

<sup>10</sup> The CEC College is currently (November 2022) composed of 23 teachers/researchers from CEC, Physics, INES, Chemistry, Biology, IIIIE and Political Science. Link to website visited by 2022-11-05: <https://www.cec.lu.se/en/om-cec/kollegium>

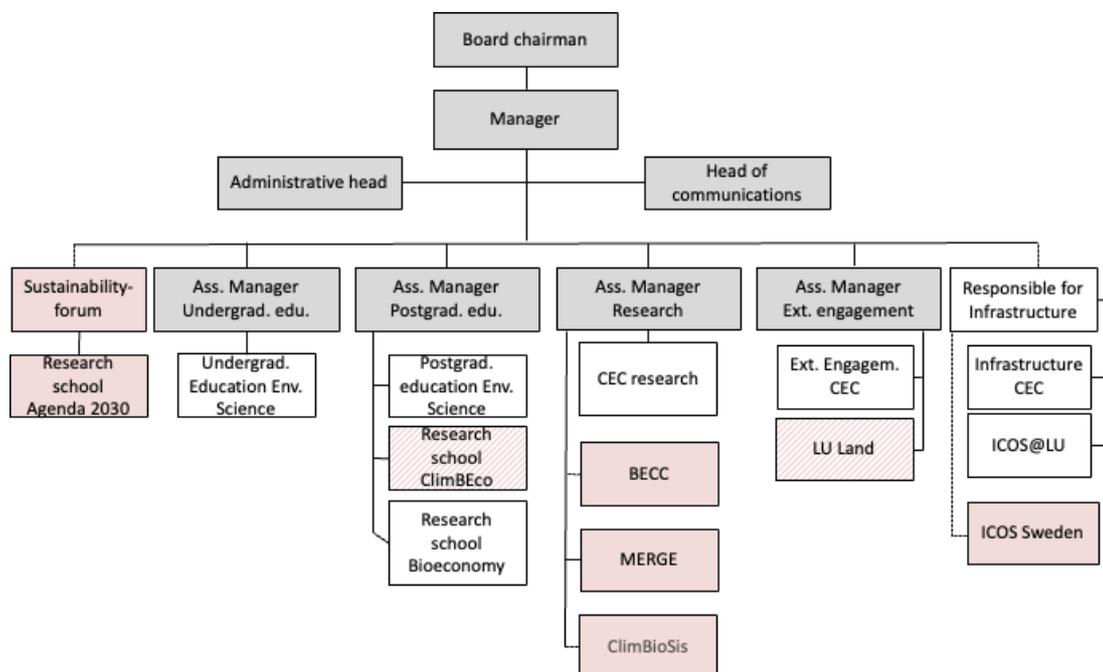
<sup>11</sup> The CEC Fellows network is open to PhD researchers working at CEC or in research areas at Lund University related to research on environment and climate. In 2022-11-05, CEC Fellows had 207 listed members and 270 recipients of the CEC Fellows Newsletter. Link to website, last visited 2022-11-05: <https://www.cec.lu.se/en/research/cec-fellows>

also to strengthen and develop it further, not least demonstrated by the CEC's ability to attract external funding for research and collaboration.

The focus of CEC's research has changed over time. It has been guided partly by strategic recruitment and research initiation efforts, partly by the research interests and availability of external funding of the research staff employed or contracted by the CEC, and partly by the focus of matrix activities organised at the CEC. Key research areas today follow the codification for the subject Environmental Science at Lund University established by the Faculty<sup>12</sup> and include human impacts on climate, land and landscape, including consequences for biodiversity and ecosystem services, sustainability and climate adaptation in urban environments, methods for scientific assessment and evidence-based decision making, environmental and climate consequences of human use of natural resources, and the dispersion, transformation and distribution of chemical substances in air, soil and water and their effects on humans, climate and ecosystems.

### CEC's organisational structure

CEC is a combined department and centre at the Faculty of Science. This means that CEC has the character of both a part of the line organisation and a matrix organisation. This characterises both the part of the activities that can be considered as core activities of an institution, i.e. the development of research and education, and the explicit centre activities that CEC carries out and coordinates.



**Figure 1.** CEC line organisation September 2022. Pink boxes indicate activities governed by their own boards/counterparts. Grey boxes indicate the management team.

<sup>12</sup> Dnr U 2020/989

As an **institution**, CEC is responsible for the research subject of environmental and climate science and the educational subject of environmental science, as well as for inter- and transdisciplinary activities (research development, collaboration and communication) related to these (Figure 1). This is done by academic staff directly employed by the CEC, academic staff of other departments accounted for by the CEC (including the CEC multi-institutional college), administrative staff directly employed by the Centre, and by purchasing services (research and education) from other departments. As of January 2022, staff accounted to the CEC's core activities, i.e. excluding staff accounted to the activities highlighted in pink in Figure 1, amounted to 59 individuals. In addition, there were 18 individuals in other departments accounted to the CEC core activities (Table 1). Staff accounted to other CEC activities are presented in Annex 3.

In 2021, CEC's total turnover amounted to SEK 92 million, divided into SEK 79 million for research and SEK 12 million for education. Research turnover was divided between External Grants 41 million, Agency grants 38 million and Commissions 1 million. A more detailed summary and trends over the last 5 years are presented in the CIG report.

**Table 1.** *Individuals assigned to CEC core activities January 2022. Table lists individuals, not FTE. Of the 8 postdocs, 3 have principal supervisors at CEC. Of the 11 staffed doctoral students, 7 have principal supervisors at CEC. Seconded staff have varying proportions of service at CEC.*

<b>Personnel category</b>	<b>Staffed</b>	<b>On loan</b>	<b>Total</b>
<b>Professor</b>	3	4	7
<b>Senior lecturer, associate senior lecturer, assistant senior lecturer</b>	4	7	11
<b>Assistant, deputy assistant</b>	2	0	2
<b>Other research staff</b>	18	1	19
<b>Postdoc</b>	8	0	8
<b>PhD student</b>	11	3	14
<b>Base administration</b>	10	0	10
<b>Research Coordinator</b>	1	0	1
<b>Communication</b>	2	0	2
<b>Technical staff</b>	0	3	3
<b>Total</b>	59	18	77

The CEC carries out centre activities partly within the framework of a faculty mandate financed by faculty funds, and partly as host to a number of platforms or cross-cutting structures – matrix organisations – which in turn coordinate and facilitate

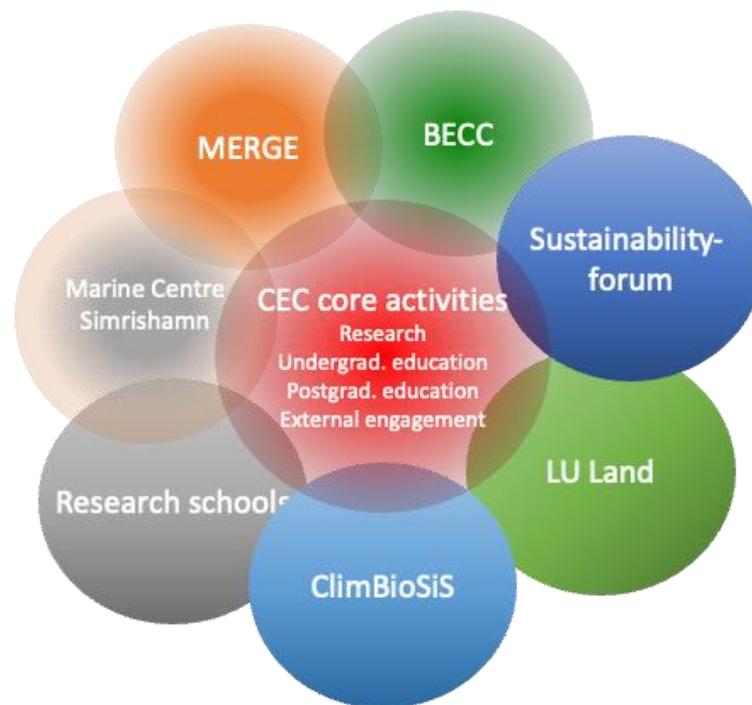
collaborations across faculty and university boundaries. The CEC's centre mission is set out in the mission statement decided by the Faculty<sup>13</sup>:

*"The Centre for Environmental and Climate Science shall contribute to sustainable local, regional and global development by being an innovative actor for research, education and collaboration in the field of environment and climate, with a broad and interdisciplinary profile. The Centre shall develop and make available evidence-based knowledge that contributes to sustainable solutions in the environmental and climate field and provide added value and leverage for disciplinary research at the Faculty of Science's departments as well as for relevant activities throughout the University. CEC will be a springboard for new generations of interdisciplinary researchers and alumni with an environmental science profile. The CEC is responsible for the development of the subject of environmental science."*

The matrix organisations refer in particular to the strategic research areas BECC and MERGE with the ClimBEco research school, the new profile area ClimBioSiS, the LU Land collaborative initiative, the research activities at Marine Centre Simrishamn, and the Lund University Sustainability Forum with the Agenda 2030 research school. The matrix activities are formally part of the line organisation (Figure 1) but are led by their own steering groups, consisting of representatives from different parts of the constituent networks (including from other universities where relevant). The director (or equivalent) of an activity is normally closely linked to the CEC. In terms of size (in terms of the number of researchers involved) ClimBioSiS is expected to be the largest, involving around 300 researchers when fully developed. BECC brings together 225 researchers at Lund University, while MERGE brings together 66 researchers at LU. The relationship of the matrix organisations to the core activities is illustrated in Figure 2. A brief introduction to the activities involved is given in Annex 3.

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<sup>13</sup> STYR 2020/1222



**Figure 2.** The core and gravitational point of CEC as an organisation, both departmental and centre activities, is currently constituted by CEC's core activities and is largely related to research, education, and collaboration in the environmental science research and education field. The activities at CEC are currently characterised by the collaborations with most of the departments within the Faculty of Science and with other LU faculties in research and education to enable the initiation and development of interdisciplinary activities. This core then acts as initiator and facilitator for the matrix organisations linked to the CEC, which in turn contribute momentum and volume to the development of activities.

### **Key findings from the interviews with CEC staff and collaboration partners**

Knowledge, understanding and insights gained from meetings and conversations with CEC staff and partners across the university have informed and underpinned the entire investigation. In this section, we highlight some specific trends and issues that have emerged.

CEC's academic staff – research and teaching staff as well as doctoral students – have broadly agreed that CEC's identity as an interdisciplinary research environment and its mechanisms for facilitating interdisciplinary and transdisciplinary research have made CEC an attractive place to work. Several note that it is not the organisational form per se that is seen as central, but it is the opportunities for interdisciplinary activity and a transdisciplinary research environment that are valued.

Administrative staff linked to networking, research coordination and communication have expressed that the working environment, learning processes and access to networks (e.g. through SFOs and the Sustainability Forum) created by being a pool of research coordinators, project managers and communicators lead to synergies and

organisational learning. It is noted that the identity as a centre formation has opened doors to networks and contexts that are often closed to a staff member of an ordinary institution, and has created a clear brand outwards to society in contact with, for example, the media and authorities. However, at times the centre organisation has created confusion and uncertainty as a university department is an organisational form that is easy to understand, while CEC's activities and hybrid organisation have sometimes created confusion about its mission and activities, both internally and externally. Both the academic staff at CEC, the administrative staff, and a large number of partners around LU have stressed the importance of keeping the different matrix organisations together.

The administrative staff linked to the basic administration have expressed, among other things, that the CEC as it is currently organised leads to a very high workload in certain areas, mainly financial administration.

This is due to the large number of activities involved, which results in a high degree of fragmentation compared to the work situation of colleagues in other departments at the faculty. It is hoped that a larger organisation, with greater basic administrative resources, would lead to greater redundancy, less stress and less fragmentation in tasks, and thus a calmer and more sustainable working environment.

Discussions at meetings with CEC staff and partners have touched on both the current and historical state of the CEC, as well as the future and the two investigations. It has sometimes not been possible to clearly distinguish the boundaries between these time perspectives – partly because the dynamic development of the activities both historically and in the future characterises the organisation. The results of the meetings are summarised as a number of identified success factors and challenges (see Annex 4). These form the basis for the analysis and conclusions of the study, together with the results of the other methods. In addition to the description above and the bulleted lists in the appendix, four critical issues were identified for investigation in relation to alternative proposals for future organisation and mission. Different variants of these were raised at a number of meetings:

- a) **Coordination of research projects.** The ability to develop large externally funded projects, located at and coordinated from the CEC, has been based on leadership at the Centre in collaboration with research groups at departments. How will the ability to undertake initiatives such as these be affected if, in future, there is no opportunity to link research to the Centre? Is the possibility of developing an interdisciplinary research environment a prerequisite for creating long-term leadership, incentives and know-how to allow the development of broad interdisciplinary projects? Does the possibility of engaging partners from across the university depend on the existence of a common platform from which to coordinate projects?
- b) **Interdisciplinary research without a natural home in existing institutions.** One of CEC's strengths has been that environmental science research with a clear interdisciplinary and transdisciplinary character has been able to develop by combining recruitment of, for example, post-doctoral researchers with the involvement of researchers from different disciplines in projects conducted at

CEC. How will the possibility of developing such initiatives be affected if research cannot be located at the Centre? Is a strong environmental science research environment as an identifiable part of a new institution a realistic option?

- c) **Opportunities for young researchers without tenure track to work at the centre.** Issues have been raised related to the possibilities for junior researchers with their own grants to work at a centre if they cannot be employed at the centre and have to find another host department. Alternatively, there will be a lack of career paths for these researchers, if they have an interdisciplinary profile that does not clearly fit into existing departments. Does this create a risk that Lund University will miss out on an opportunity to recruit tomorrow's leading interdisciplinary environmental researchers? Teachers/researchers across the University can be associated with the activities through the mechanisms described above, for example by having an appointment at a department with (partial) accounting at the Centre, and research students can be given the opportunity to work at the Centre through, for example, graduate schools, while a specific mechanism for younger independent researchers needs to be considered.
- d) **Interdisciplinary education.** Neither this study nor the CIG study deals with education, but a complete policy framework must clarify which structure takes responsibility for the development and quality of environmental science education, building on the combined strengths of researchers at a number of departments at N, LTH, S, E, M and IIIIEE, and in the future hopefully also HT.

### Key findings from RQ20

CEC was not evaluated as an organisation by Lund University's major Research Quality Evaluation Project 2020 RQ20, but instead researchers associated with CEC were included in a number of different Panels and the underlying Units of Assessment (UoA)<sup>14</sup>. This means that there is not an overall analysis of CEC, but a number of conclusions that are shaped by each Panel's findings. In addition, parts of the CEC matrix organisation, specifically the SFOs, were evaluated in the Large and Interdisciplinary Research Environments (LIRA). However, the fragmented nature of the evaluation means that the conclusions about CEC are few and contrasting (Appendix 5).

Only the Environmental Science and Biology panel explicitly mentioned the CEC, stating that it was "an excellent research environment under strong leadership", but that opportunities for interdisciplinary collaboration with other activities at LU were not fully exploited. Specifically for the activities linked to the UoA on biodiversity and ecosystem services, efforts are needed to "increase the number of affiliated or associated social scientists with complementary competences". One conclusion is that

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<sup>14</sup> In particular, CEC researchers were represented in the UoA "Biodiversity and Ecosystem Services (B2.1)" under the panel "Environmental Science and Biology (ESB) and the UoA's Ecosystem Modelling and Climate Impacts (EMCI) and Terrestrial, Atmospheric and Aquatic Processes (TAAP)" under the panel Earth Evolution, Climate, Environment & Ecosystems (EECEE). However, researchers from CEC were represented in a number of additional UoAs.

LU would benefit from “supporting and stimulating increased collaboration between CEC and LUCSUS”.

The Large and Interdisciplinary Research Environments (LIRA) panel was essentially very positive about LU’s SFOs, noting that they should be maintained and developed as dynamic environments by LU’s management better exploiting their potential, better monitoring their activities, and better using them to promote LU internationally.

### **Analysis of comparator organisations relative to CEC’s current activities**

The investigation has been inspired by a number of comparative organisations at and outside Lund University. These have different functions and focuses. *LINXS (Lund Institute of advanced Neutron and X-ray Science)*, *UPSC (Umeå Plant Science Center)*, *IIASA (International Institute for Applied Systems Analysis)*, *Stanford’s Woods Institute for the Environment*, and *FTZ NK (Sustainable Development and Climate Change Management at HAW Hamburg)* have a pronounced focus on excellent (basic) research, while the *Pufendorf Institute* at LU profiles itself as an “incubator for new interdisciplinary ideas”. *AgriFood* at LU/SLU, the *Baltic Sea Centre* at Stockholm University and *GMV (Gothenburg Centre for Sustainable Development at the University of Gothenburg and Chalmers)* have clearly collaborative focus, with mechanisms and service titles focusing on analytical activities and direct policy-relevant activities. The GIS Centre at LU has a clearly formulated main mission to “disseminate the use of geographic information systems within the University”. This means that none can serve as a model for a future CEC, but that elements can serve as inspiration.

Common to all activities is that they have strong motivational mechanisms and clearly articulated profiles and missions. Their activities are clustered around a clear core with mechanisms and incentives for researchers and collaborators to come together. The mechanisms and incentives can be in the form of tangible infrastructures - MAX IV, ESS, GIS tools, greenhouses and labs, databases and modelling tools (LINXS, GIS-Centrum, UPSC, IIASA), or organisational infrastructures such as thematic calls, seed money and research calls and physical facilities to gather in (Pufendorf, LINXS, Stanford Woods). Several have research schools and post-doctoral programmes (Stanford Woods, IIASA, FTZ NK). GMV brings together a wealth of expertise in project management and coordination, and also hosts external activities with a sustainability focus (Sida’s Helpdesk for Environment and Climate Change). Know-how, networks and interfaces for advanced policy-relevant analysis and collaboration are a feature of IIASA, AgriFood, GMV, the Baltic Sea Centre and Stanford Woods. Several have extremely institution-like organisations (LUCSUS, IIIEE, IIASA, HAW, UPSC), while others are more pronounced centre or network activities (LINXS, Pufendorf, GMV). AgriFood and GIS-Centrum are examples of relatively small activities with pronounced excellence.

The corresponding tools currently available for CEC centre activities are infrastructure in the form of ICOS, the Marine Centre and modelling tools of various kinds within BECC and MERGE, as well as methods and resources for collaborative work, communication and production of reports, syntheses and science/policy briefs through

the CEC communication department, and resources for collaboration and research development. Funding is available for thematic initiatives and research exchanges mainly in SFOs and CEC core activities. CEC currently lacks physical space for groups to meet in that are not already based at CEC.

Several of the comparator organisations show the potential to further develop activities to clarify policy relevance, and to further develop strategies to communicate research results in the right way, at the right time, to the right recipients (GMV, AgriFood, Baltic Sea Centre, IIASA). Within the CEC network, research is carried out that directly links to international instruments such as IPBES, IPCC, CBD, to the policy work of Swedish authorities (in particular the Swedish Board of Agriculture, the Swedish Forest Agency, the Swedish Environmental Protection Agency, the Swedish Chemicals Inspectorate), to local and regional administrations and to the strategic work of companies (MISTRA BioPath), but the capacity for environmental analysis and synthesis work is limited.

## Policy options and associated risks

The terms of reference stipulated that this study should clarify how the CEC's centre function could be organised in the future, assuming the creation of a new institution incorporating the current activities of the CEC, INES and the Department of Geology. We have therefore taken as a starting point the organisational proposal as described by the CIG study for the CEC centre function:

*“The network activities belong to the department, but have their own budget for their activities. In order to maintain its strong interdisciplinary activity as well as cooperation within Lund University and with the rest of society, we propose that the network retains the name Centre for Environmental and Climate Science (CEC).”*

As a consequence, we have not investigated the full integration of the CEC centre activities into a CIG(B) institution<sup>15</sup>, but limited ourselves to investigating an activity with its own management, budget and activities.

Based on the overall picture of the study, based on the meetings with CEC staff and partners across the university, the analysis of CEC's history and activities from 1998 to 2022, and the inspiration and lessons learned from the comparator organisations, we have come up with a number of key aspects that need to be considered in the analysis of possible scenarios (Figure 3):

1. **Legitimacy.** CEC's matrix activities span faculties and departments, and have partners at universities and institutes around Sweden. For the legitimacy of the activities, it is essential that a future organisation reflects this. This means that the activities must enjoy relative independence and have a visibility that allows them to be perceived as a *common concern for the partners involved*.

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<sup>15</sup> Organisationally, such full integration would likely involve multiple centre formations at the CIG institution corresponding to current matrix organisations or alternatively these activities being located elsewhere in the organisation.

2. **Leadership.** The development of interdisciplinary activities in a dynamic research and policy landscape requires strong leadership. That is - it requires not only strong leadership of the constituent components, but also *strong leadership of the coordinated organisation* that can take advantage of LU's diverse research orientations, meet society's changing knowledge needs, and proactively respond to changes in the national as well as international research funding landscape.
3. Development of interdisciplinary activities requires the commitment of teachers/researchers to lead and develop interdisciplinary projects and collaborations. This requires an *internal incentive structure, such as* opportunities for in-service research, access to post-doctoral programmes, funded graduate schools, etc. An association mechanism can be flexible, for example by not employing teachers/researchers directly but by assigning them to the centre. Such an incentive structure would need to target a wider range of teachers/researchers than those employed by a new CIG institution if the breadth of activities currently handled by the CEC is to be maintained and developed.
4. **Administrative skills.** The specific administration of interdisciplinary research and collaborative initiatives has its own characteristics that distinguish it from the basic administration of a traditional institution. By linking the different matrix activities of the CEC, an *attractive workplace can be created that attracts and retains competent project managers, coordinators and communicators*. It also creates redundancy in the organisation and thus stability and flexibility.
5. **Attractiveness.** Maintaining and strengthening the development of internationally leading, excellent interdisciplinary research requires a *research environment that attracts and invites collaboration across faculty boundaries, nationally as well as internationally*. It requires some kind of core around which to gather, which may be infrastructure (physical or organisational), funding opportunities, or an inspiring research environment built on a long-term basis around a core team. It is important to be able to attract and provide opportunities for both established internationally prominent researchers and promising early career researchers to work in the environment for short or longer stays. This requires *physical location*.

With this in mind, we have identified two discrete options for how the business might be organised in the future. While intermediate options are entirely possible, we describe possible consequences of these discrete options for greater clarity. The alternatives are:

1. A **centre** with a mission to also facilitate, support and drive the development of excellent interdisciplinary environmental research
2. A **network organisation** with a mission focused on the coordination of existing and possible future centre activities



**Figure 3.** Key aspects to consider in creating a long-term organisation to stimulate inter- and transdisciplinary development in the environment and climate field.

### A future centre

A centre facilitates the possibility of fulfilling all the critical aspects we have identified (Figure 3). Such a centre has an overarching inter- and trans-disciplinary activity with the possibility of engaging faculty/researchers employed by institutions, provides a physical workspace and meeting point, and has the task of coordinating and facilitating existing matrix activities and creating new ones.

We believe that it is of secondary importance whether such a centre is located directly under the faculty or under a department. What is crucial is that the activities enjoy relative autonomy by being based on the possibility of strategic development of the overall activities, de facto control of allocated funds, and that the individual matrix activities are de facto governed by partner steering groups. The ability to strategically develop research and collaborative activities over time creates the conditions for securing a place at the forefront of a research landscape where both the methods of interdisciplinary research (e.g. methodological development in scenario analysis) and the disciplines that are relevant (e.g. the increasing importance of AI in environmental research) change over time, as do the possibilities to respond to society's changing needs for knowledge to meet societal challenges. Strong links with research in relevant institutions ensure that activities are based on theoretical and methodological developments in interacting disciplines. The development of the CEC College with appropriate mechanisms of association and incentives has the potential to strengthen such links between research environments in disciplinary institutions and inter- and transdisciplinary activities at the Centre.

A centre with an overarching mission to lead research development and collaborative activities, and to coordinate a number of constituent relatively large matrix organisations, requires clarity in the governance structure. This includes the need for a clear division of roles between the Director/Board of Directors of the Centre's activities

and the other Directors/Coordinators/Steering Groups of the constituent matrix organisations. The relationship between the overall centre activities and the matrix organisations is bound to be complex, as the organisations receive their mandate through different routes in the organisation (formally in the line organisation or through decisions by, for example, the Vice-Chancellor). We see the solution to this is for larger matrix organisations to be part of the centre's management and for the centre's management to be given a good insight into and opportunity to have an input into the strategic decisions of the matrix organisations. It also requires a clear division of roles between the management of a future centre and the head of the host institution of a future organisation.

Challenges of a centre are to meet the need for staff to fill management positions and committees in the absence of in-house direct academic staff. To achieve this, the ability to attach part-time staff to the Centre for longer periods of time is required. There also needs to be sufficient redundancy in the organisation to respond to rapidly emerging opportunities in the form of major calls from funders, or needs from patrons – especially for future activities with a strengthened function in policy-relevant synthesis and analysis.

### **Scientific focus of the Centre**

The scientific orientation of a future centre may evolve in different directions. A centre with limited resources in terms of staff and tools to identify, manage and implement strategic research initiatives will be defined mainly by the matrix activities associated with the centre. A centre with a broad environmental and climate focus (current CEC with possible broadening as suggested in discussions with collaborative partners at LU and the CIG study) and the resources to address this has the potential to dynamically address current and future societal challenges and thus be a tool for the faculty and LU to respond to the mission to address and propose solutions to societal challenges as outlined in the latest Research Bill<sup>16</sup>.

In order to clarify the choices, opportunities and risks associated with the centre's activities, we set out below two scenarios for a future centre organisation, which differ in terms of their focus on research development.

A delineated variant would be a **global change centre**, defined by some major matrix activities located at the CEC today. Here we define global environmental change as occurring on a planetary scale, either because the underlying processes are global or because human impacts are so widespread that they produce planetary effects. Examples include climate change, altered biogeochemical cycles, land use change and biodiversity loss, but sometimes also include chemical pollution. A strength of such a focus would be increased clarity and thus the ability to communicate the Centre's profile, combined with the scientific strength provided by the close links with ClimBioSiS, BECC and MERGE. A risk of such an orientation, which has been highlighted in several meetings with staff and partners, is the creation of ambiguities in the profile

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<sup>16</sup> prop. 2020/21:60

and roles towards the future CIG institution, which is however counteracted by the fact that a large part of the global-change related research will remain outside a future CIG institution. One question that remains unanswered in the formation of a global change centre is who will take responsibility for genuine interdisciplinary, cross-faculty and transdisciplinary development of environmental science research in a broader perspective? It also becomes more difficult to justify why matrix activities with a broader focus than global change should continue to be located at the centre.

**A centre with a broad environmental and climate focus** would clearly respond to society's needs for research and knowledge related to global societal challenges, but also require defining a focus that is sufficiently clear to create an identity internally and externally. Our view is that such clarity is provided by an environmental and climate focus that starts from a natural science perspective, where the earth's resources and capacity to assimilate human impacts set limits to existence, and that links to other sciences to address within this framework the global goals of Agenda 2030 and the Swedish environmental quality goals. Such a centre can be an instrument to live up to the LU Sustainable Development Strategy 2019-2026 and its emphasis on cross-disciplinary collaboration to contribute to sustainable development.<sup>17</sup> At the same time, such a centre can provide greater opportunities to contribute to the visibility and development of the profile area and SFO activities for the future in line with the SFO Strategic Plan and the LU Sustainable Development Strategy 2019-2026<sup>18</sup>, by facilitating them to broaden and renew their cross-disciplinary networks.

For environmental science as it is conducted at CEC today, a natural and desirable development would be to strengthen links with, for example, environmental chemistry, materials research, environmental psychology and environmental medicine. Proposals to broaden the activities of the Centre in this way have been put forward by relevant partners during the meetings of the study. The activities can be further developed by initiating, coordinating and participating in broad interdisciplinary departmental and faculty-wide initiatives at LU to strengthen links with LUCSUS, IIIIEE, LUSEM, and other activities. In particular, broad activities can provide flexibility in strengthening external funding in a research and funding landscape that is evolving towards broad interdisciplinary projects with strong collaborative elements. Risks associated with broadening the Centre's activities in terms of research focus according to these proposals are linked to dilution effects where available resources for coordination, communication and collaboration are not sufficient to meet the needs of the activities, which is already a clear challenge for the CEC's activities.

Whatever the way forward in terms of research focus, it is essential that there is clear academic leadership to implement research initiation and development strategies at the Centre. Through strong leadership, possibly through international recruitment, development can be born out of inspiration, while researchers linked to the Centre enjoy academic freedom to develop their research freely.

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<sup>17</sup> STYR 2017/1345

<sup>18</sup> STYR 2019/718, STYR 2017/1345

## A future network organisation

An alternative to a centre is a **network organisation**. A network organisation has the task of coordinating and coordinating the centre activities that are the focus of the study, and any new activities that are created in the future. Coordination within a network organisation creates efficiency gains, increases redundancy and contributes to a good working environment for administrative staff dealing with the activities of the matrix organisations. In addition to this, a network organisation can have a broad mission to facilitate interdisciplinary environmental and climate research and increase its impact. This may include supporting broad research applications, which however are not coordinated from or conducted at the network organisation. A network organisation with the capacity to develop new network activities, project management, and communication can support both constituent matrix organisations and research development/collaboration/communication elsewhere in the faculty.

A network organisation has a number of limitations. We believe that a network organisation cannot support either undergraduate or postgraduate environmental science education, which means that at least parts of the **CEC college** need to accompany the organisation that is given responsibility for the environmental science research and education subject. A network organisation without strong resources will have limited momentum of its own, which risks giving it the character of multiple but coordinated centres within the CIG institution. If a network organisation has more limited resources of its own than a centre, its ability to support constituent matrix organisations, for example to act as a buffer when their funding varies over time, is reduced. The ability to take new initiatives in matrix organisations and the like is also likely to be less than in a centre, as researchers/teachers are not linked to the organisation in the same way as to a centre.

The form of organisation can affect constituent matrix organisations in different ways. **ClimBioSiS**, **BECC** and **MERGE**, through their volume and synergy, have organisational stability regardless of the overall organisation of their activities. The **ClimBEco graduate school** is financed by direct funds from the Faculty of Science and has stable conditions through its link to BECC and MERGE. **LU Land** is vulnerable through its funding form (time-limited funds from LU), and will need support for its survival so that the activities and expertise in collaboration and knowledge co-production that have been built up are not lost. The **Marine Centre** is entirely dependent on in-kind support with basic administration, and cannot be located at an activity that cannot provide that support.

**The Sustainability Forum with the Agenda 2030 Research School** has sufficient direct funding to be organised as a separate matrix organisation. It is, however, unclear what benefits the activities would have from being located at the CIG institution under a network organisation. In deciding to proceed with a network organisation, the location of the Sustainability Forum should therefore be considered.

In order to initiate and facilitate, but not coordinate and conduct, inter- and trans-disciplinary activities at the faculty, a network organisation needs specific resources. However, we see problems with leadership and the risk of brain drain. The limited

mandate and importance of the network compared to the current CEC may create problems in engaging leading researchers in the activities. For example, a network organisation does not function as a legitimate common platform for interdisciplinary projects in the same way as a centre. Furthermore, the advanced communication, collaboration and coordination support for transdisciplinary research development provided at the CEC today is possible partly because research coordinators (and other similar titles) are staff with PhDs in relevant subject areas, and partly because they and qualified communicators and research communicators work closely together and in close proximity to the research. As an integrated working environment in which these staff work closely with relevant researchers is more difficult to create in the context of a pure network activity, the possibilities to work strategically on the development and integration of research co-ordination - collaboration - communication are hampered. There is thus a risk of depletion and loss of focus of collaborative support and research initiation support, as well as a risk of brain drain.

The various risks we highlight do not preclude a network organisation from serving as a powerful organisation for facilitating interdisciplinary research, collaboration and communication. Given a broad mission and sufficient resources, such an organisation, together with the matrix organisations, could develop the faculty and university's environmental and climate research by creating interactions, and building specific expertise around collaboration that is difficult to develop at each activity. On the other hand, the risk analysis aims to highlight that there are functions that will be lost if the organisation is chosen as a network organisation rather than a centre.

### **Association and incentive mechanisms**

Whatever form (centre vs. network organisation) and focus (environmental science vs. global-change) is chosen for the activities, forms and mechanisms are required for academic staff to work at the organisation.

Association mechanisms can be flexible, but they must be transparent and clear, not least to avoid discrimination resulting from informal recruitment processes<sup>19</sup>.

### ***Association of teachers and researchers to the centre***

A centre that facilitates, coordinates and develops interdisciplinary research needs some kind of core around which to rally, and an engine to drive development forward. At the CEC, this core and engine has historically consisted of the meeting of researchers in the research, postgraduate and undergraduate bodies in the environmental sciences. The CEC College is made up of senior researchers from around the University who have been involved in various ways in the activities, initially primarily in undergraduate and postgraduate environmental science education, but over time also in other capacities including management. In addition to the CEC's own faculty, this has included faculty on part-time contracts at the CEC. The College has created a natural interface between the departments involved and the Centre. The same applies to the graduate schools,

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<sup>19</sup> Vetenskapsrådet 2021, report VR2106: How equal is it in higher education? Women's and men's conditions for conducting research

which also provide a natural meeting point and interface. In addition, there is the CEC Fellows network, a pure network organised by the CEC, which has, among other things, created meeting places for interdisciplinary discussions on various scientific themes and facilitated new collaborations in applications to calls for proposals requiring interdisciplinary consortia.

A centre that should continue to be able to act as an engine for interdisciplinary and transdisciplinary research initiatives and research development risks losing momentum if cohesive elements such as education and research training are removed without being replaced by other cohesive mechanisms. In addition to meeting places and arenas for collaboration, there must also be incentives, resources and “rewards” for researchers who choose to invest time and effort in driving the activities of the centre forward. Both for the individual researchers, for the Centre’s activities, and for Lund University’s ability to maintain its prominent position as a research actor in environmental and climate research, it is necessary that it is fundamentally positive to engage in interdisciplinary research development at the Centre, as a complement to disciplinary research at one’s home institution.

It is the view of the inquiry that strong interdisciplinary research needs to be grounded in the constituent disciplinary research subjects in order to maintain its rigour and excellence. From this point of view, it is positive that the Centre is “staffed” with research personnel from different subject departments through mechanisms such as being assigned to the Centre or having time in their job description to work on Centre-related activities. At the same time, interdisciplinary activities require time to build up networks and specific skills, which means that involvement in the activities of a centre, at least for some academic staff, must be long-term. For researchers linked to a centre, clarity is needed on what the mission is about, e.g. management tasks, collaboration, etc., but in order to be attractive, also a freedom (research within the service) to develop their own inter- and transdisciplinary activities within the framework of the mission. In order to combine anchoring in disciplinary research with continuity and responsibility for inter-/transdisciplinary development, it is therefore our view that a flexible assignment to the centre of researchers/teachers who are principal employees at other institutions should be combined with either a core of in-house academic staff or more likely with attachment mechanisms (onboarding, explicit part of the service) of sufficient duration to ensure management functions and methodological development.

A strength of the current CEC, shared with other strong organisations we compare with such as LUCSUS, is the ability to coordinate and run interdisciplinary research projects. Developing and running such projects often requires competencies that do not easily fit within the current departments of the faculty, such as methods of integrated analysis and transdisciplinary research methods. The possibility of employing research staff who can work on such aspects is then a strength. A centre with the ability to employ its own staff can partly address this through the recruitment of post-doctoral researchers and researchers, while the recruitment of faculty requires a clear link to teaching. Without the ability to recruit staff and influence recruitment, opportunities for interdisciplinary renewal are hampered and the ability to attract external resources is

inhibited. We believe that the staffing issue can be resolved under different organisational forms. If the Centre does not have its own teaching staff, we believe it is critical that the Centre develops forms of dialogue with collaborating institutions on future recruitment strategies. We also consider it essential that a centre has the possibility to recruit staff for externally funded projects. In order for there to be some opportunities for researchers at the Centre to progress in their careers at Lund University, there needs to be a continuous dialogue between the Centre's management and subject departments about future recruitment.

### ***Association of teachers and researchers to network organisation***

For a network organisation, the number of researchers/teachers associated is more limited than for a centre, as the mission of such an organisation is narrower. In particular, researchers/teachers need to be recruited for the management functions of the network activities, but depending on the design of the work, also to work on collaborative projects, development of graduate schools, etc. Since a network organisation does not carry out its own research development, it is reasonable that the remuneration is dimensioned to allow the persons involved to develop their own inter- and transdisciplinary activities as part of the mission, i.e. to ensure that assignments at the network organisation do not compromise the possibility of carrying out research in the service.

### ***Incentive mechanisms***

In addition to mechanisms of association, researchers may have incentives to participate and develop activities through the provision of activities and support by the organisation that can develop their own research. Below is a summary of incentive mechanisms designed primarily to hold a centre together, and to create opportunities for strategic research development to meet future challenges in a shifting research policy landscape. Many of the mechanisms below can in principle also work in a networked organisation, but the basis for the operation must be that researchers/teachers are assigned to the Centre to carry out the tasks in question.

1. **Continued operation of graduate schools and new postdoctoral programme.** By continuing to be located at a future centre, the ClimBEco and Agenda 2030 graduate schools could provide incentives for researchers/teachers to be linked to the centre. Similarly, resources for doctoral positions, such as variants of how the CEC's environmental science postgraduate programme was originally<sup>20</sup> was originally intended to function, or an equivalent postdoctoral programme, act as incentives. At the same time, initiatives such as these would help to maintain the Centre as a dynamic interdisciplinary environment, where young researchers and their supervisors meet and thus provide a bridge between interdisciplinary and disciplinary research. A network organisation could also host graduate schools. However, a stripped-down network organisation cannot provide a dynamic research

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<sup>20</sup> With the increase in the number of in-house teachers, the resources for doctoral positions have been partially internalised.

environment in which to operate, but would have a more administrative, coordinating role.

2. **Create thematic calls.** Thematic calls to provide opportunities for new research directions, interdisciplinary interactions or externally funded projects are tools used by the Pufendorf Institute, LINXS and BECC, among others. The Pufendorf Institute also has “mini-themes” in the form of the Advanced Study Group (ASG). Theme calls require funding in the form of funds either to finance research time carried out within the theme (Pufendorf theme), or to finance the possibility for researchers to come together in new groups and constellations, without directly funding the research being carried out (BECC Action Group, LINXS theme, Pufendorf ASG). Similar efforts have also been made at IIASA (e.g. Greenhouse Gas Initiative). This type of mechanism has proven successful in generating new directions, but is also resource intensive in its most developed form (Pufendorf theme). Activities are stimulated if appropriate facilities for interdisciplinary interaction are available. An interdisciplinary environment can act as a host and support for new initiatives born out of thematic calls.
3. **Provide advanced coordination, project management and communication support.** Both partners and staff at CEC request support with coordination, project management and communication related to environmental and climate-related research projects. This need is based on the fact that the research funding landscape is moving towards larger and larger calls with higher demands on coordination, collaboration, project management and communication. There are also demands on the modalities for this, such as the “multi-actor approach” in Horizon applications. The support requested concerns both the writing of applications and the implementation of research projects and programmes. The CEC currently has relevant skills, but often not sufficient capacity, to provide this support in full. For example, there is often a lack of redundancy to allow for strategically enhanced support at critical times, such as when writing proposals or reporting on projects. Similar problems exist for project-related communication activities. A mechanism that allows multiple projects, whether located at the Centre or not, to share coordination, collaboration, project management and communication skills would help to strengthen collaboration and research development with partners across LU. A scaled-down network activity could have tasks related to various forms of collaborative and communication efforts, as well as tasks related to facilitating applications and the start-up of future research and collaboration programmes or environments. However, there would be no strategic mechanisms for this, and the activity would be relegated to running inspirational events, creating meeting places, matchmaking, etc. The network thus risks losing its initiative and its status as a natural host for future environmental and climate research efforts, and risks stagnating and losing its relevance over time.
4. **Develop a new focus on policy-relevant decision support.** Several of the centres looked at by the study, like the CEC, offer policy-relevant decision support. However, producing these is a challenge because they need to be synchronised in time with decision-making processes - such as the updating of the EU’s Common Agricultural Policy (CAP) – but they also need to be scientifically sound, which places demands on time and resources, as it is a matter of communicating syntheses and syntheses on a scientific basis and not

individual research results. In order to ensure that sound research results and syntheses are fed into the process at an early stage, inputs are needed into the reports that form the basis of the directives and studies for updating policy documents and international agreements. Researchers working at CEC and collaborators have in many cases already established pathways and entry points towards e.g. IPBES, IPCC, CBD, EC, EFSA, Swedish government, agencies, etc. These activities are currently dependent on individuals and are therefore vulnerable. A well-functioning activity that contributes with relevant scientifically based decision support needs an organisation for systematic strategic environmental monitoring. In addition, it is necessary to be able to co-finance activities in order to be able to work with evidence where external funding is lacking, and to supplement external funding from, for example, authorities in order to ensure sufficient quality in the work. An expanded systematic activity based on well-established methods for synthesising scientific knowledge would create added value for environmental and climate research at the Faculty and Lund University and for researchers to make their research more policy-relevant. To a limited extent, LU Land and CEC are working on this, while models of a slightly larger format are available from, for example, AgriFood, IIASA and the Baltic Sea Centre. We believe that an expanded initiative along the lines of the synthesis activities currently carried out at the CEC, the BECC, and by other actors around the University, with a focus on producing and making available research results, would be an invaluable support for collaboration but that this requires a concerted effort at one centre.

## Conclusions and recommendations

We believe that within the framework of a future CIG institution, it is possible to create a powerful centre that can continue to drive the development of inter- and transdisciplinary research and collaboration in close cooperation with subject-oriented research at Lund University in general and the Faculty of Science in particular.

The coordination of centre functions over time has depended on the link with the transdisciplinary research and education subject of environmental science, as this has served as a platform for networking and provided incentives and resources for leadership and further business development. At the same time, this dependency has been two-way, so if responsibility for environmental science is separated from the coordination function, new instruments are needed to create incentives to continue developing interdisciplinary activities in collaboration with departments in the Faculties of Science and other faculties, and in interaction with societal stakeholders. Over time, profile areas and strategic research areas have come to play an increasingly important role, but do not have the same breadth as the environmental science network.

*The report therefore points to the need for a centre as a cohesive driving force that, through dedicated mechanisms, creates incentives to link researchers to the centre's activities and, through a professional organisation, can drive forward the broad development of environmental and climate research and strengthen its impact.*

The conclusions and recommendations presented below relate to the two main questions formulated: *What are the possible target images?* and *What functions are needed to meet the objectives?* The sub-questions formulated form the basis for the recommendations.

### **What objectives for trans- and interdisciplinary research development and collaboration are possible for a new organisation?**

The study identifies two possible objectives:

- A *centre* that conducts interdisciplinary and transdisciplinary research development and analysis, either focused on *climate and environmental science research* from a broad perspective or more narrowly focused on *global change research*.
- A *network organisation* with the mission to coordinate existing and future matrix activities, facilitate communication and collaboration, and support research development.

#### *Recommendations*

- We recommend the further development of a centre with relative independence and its own budget with the ambition to keep Lund University at the forefront of broad, inter- and transdisciplinary climate and environmental research, with strong involvement in international knowledge and policy work, and which develops collaboration to be an obvious point of contact for societal actors.
- We recommend that the possibility of conducting research at the centre is ensured, and that this is broadly environmental science in order to respond to knowledge needs related to the societal challenges defined in Agenda 2030 and the Swedish environmental quality goals. This should go hand in hand with a mandate for deeper collaboration with relevant activities at LU.
- We recommend ensuring that strong mechanisms are in place to enable researchers to work at the centre and take long-term responsibility for research development and collaboration, and that opportunities for recruitment and future careers for younger researchers are secured.
- We recommend that if the decision is made to create a network organisation, the organisation is given a broad mandate to work on initiating and facilitating inter- and transdisciplinary activities at the faculty in order to meet the intentions of Lund University's strategies for strategic research areas and sustainable development 2019-2026<sup>21</sup>.

#### *Motivation*

A centre creates a *legitimate* platform for broad interdisciplinary collaboration at which cross-departmental and cross-faculty research projects and matrix organisations in the environment and climate field can naturally be placed. The ability to develop research over the long term creates a basis for strong *leadership*, enabling the organisation to continue to support the dynamic development of new inter- and trans-

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<sup>21</sup> STYR 2019/718, STYR 2017/1345

disciplinary research projects. A centre with research activities and broad collaborative expertise creates *incentives* for researchers from different disciplines to participate in its activities. A coherent research-related activity creates a workplace that can build a *competent administration*. A physical research environment provides an *attractive* meeting place and host for international visiting researchers. A centre can also, together with *faculty association mechanisms* and the *possibility to hire researchers*, enable the recruitment of faculty (in collaboration with departments) and young researchers.

A network organisation needs a clear and broad mandate if it is to be relevant as a host to wider matrix organisations and play a role beyond that of Profile Areas and SFOs. A network organisation has a more limited functionality than a centre in that it does not act as a legitimate platform for broad research projects, making it difficult to build strong leadership. A network organisation is less likely to create an exciting interdisciplinary environment where researchers/teachers are engaged on a part-time basis.

### **What functions need to be in place in a future organisation to meet the vision?**

The functions that the study identifies as necessary to meet the recommended target are:

- Dedicated academic and administrative staff to drive the business forward
- An association model to link academic staff to the Centre
- Incentives and mechanisms to motivate and enable continued inter- and transdisciplinary environmental research development
- An organisation to support policy-informing activities: science-based synthesis, communication activities, and policy analysis
- A physical workspace to bring together academic and administrative staff working at the Centre on a full-time, part-time or temporary project basis

### *Recommendations*

- We recommend an organisation based on senior researchers employed by subject departments, where these departments work closely with the Centre and gain added value from having staff linked to the Centre. The senior researchers are assigned to the Centre on a long-term basis for management functions and business development. The director/leader should be employed by the Centre and have the mandate and ability to manage both the Centre's operations and research development.
- Based on what is possible in terms of resources, we recommend the development of a postdoctoral programme, and if the environmental science education is not located at the Centre, also a PhD programme. Furthermore, the ClimBEco and Agenda 2030 graduate schools should be located at the Centre. Visiting researcher programmes are developed together with matrix organisations.

- We recommend that the activity be given a mission linked to the formation of a cabinet or equivalent to drive strategic policy-relevant communication and collaboration in collaboration with relevant researchers.
- We recommend that the physical, organisational and financial conditions are in place for researchers in the CEC network to meet physically at the CEC for joint research projects.

### *Motivation*

In order to have the capacity to dynamically develop inter- and transdisciplinary research, a centre must engage disciplinary researchers in long-term management and operations. This requires clear association mechanisms and incentives. Association mechanisms can be based on researchers/teachers being accounted to the centre for the tasks they perform, but in order to give the researchers involved academic freedom to develop interdisciplinary research and collaboration, resources should also be available to develop their own activities under academic freedom. A centre with strong activities will be better able to develop synergies with existing matrix activities and to initiate new matrix activities, thus addressing a dynamically evolving research landscape and new societal challenges. Mechanisms to support synergies can provide critical expertise that is difficult to provide in each research environment.

### **Final words**

The report concludes that the faculty has the opportunity to create a powerful centre for inter- and transdisciplinary research, collaboration and communication in the field of environment and climate. A clear scientific identity for the centre can be created from a natural science perspective on the subject of environmental research, where the earth's resources and capacity to assimilate human impacts set limits to existence, and which links to other sciences to address the global goals of Agenda 2030 and the Swedish environmental quality goals within this framework. In this way, researchers from the different departments of the Faculty, as well as researchers from other faculties, can be engaged in the activities with appropriate mechanisms of association. Crucial for the Centre is the possibility to create incentives to contribute to the inter- and transdisciplinary activities, through opportunities to develop research linked to the Centre. Secondly, networking activities can be created, which, depending on the level of resources allocated to support collaboration and communication, will be more or less characterised by the strategic research areas and associated activities.

## Annex 1. Sources of background and analysis

The following sources have been used to analyse the current situation and describe the history and analysis of the CEC:

- CEC strategy documents (vision, business plans)
- Regulations for the Centre for Environmental and Climate Research (CEC) (Dnr 2009/526)
- Regulations of the Centre for Environmental and Climate Research (CEC), Amendment 2010-09-16 (Dnr N2010/337)
- Regulations for the Centre for Environmental and Climate Science (CEC) (STYR 2020/1222)
- Statistics on turnover and personnel
- RQ20 - mainly Biology II, EECEE and Large and Interdisciplinary Research Environments (LIRA) reports.
- Report Review of the organisational structure and long-term funding of the Centre for Environmental and Climate Research (CEC), Lund University
- The document CEC's comment on the report "Review of the organisational structure and long-term funding at the Centre for Environmental and Climate Research (CEC), Lund University" (STYR 2019/286)
- Strategy for Lund University's strategic research areas (STYR 2019/718)
- Strategy for sustainable development for Lund University 2019-2026 (STYR 2017/1345)
- General study plan for doctoral studies in environmental science, NAMILJ01 (U 2020/989)
- Designation of profile areas at Lund University and allocation of joint funds for further development of profile areas 2022-2024 (STYR 2021/2396)
- Vetenskapsrådet 2021, report VR2106: How equal is it in higher education? Women's and men's conditions for conducting research

## Annex 2. Table of meetings and interim reports

Function	Target group	Date	Comment
CEC operational management	CEC Management Group	20 Sept.	Management Group Meeting
	CEC Training	21 Sept.	Representatives of education
	CEC Research Training	26 Sept.	Representatives of postgraduate education
CEC employees	CEC all personal	4 March 2 Sept.	Information point at staff meeting
	CEC Administration	13 Sept.	Discussion point at the regular admin meeting
	CEC Doctoral students	21 Sept.	Information and discussion meeting
	CEC research and research-related	21 Sept.	Information and discussion meeting
Centre-- activities at CEC	BECC Board	8 Sept.	Information point at board meeting
	Marine Centre	19 Sept.	Management representatives
	BECC, MERGE, ClimBEco, LU Land, Sustainability Forum, ClimBioSiS	20 Sept.	Representatives of the management of each activity
Cooperation partners at LU	CEC College	23 Sept.	Several faculties
	AgriFood	30 Sept.	Representatives at the CEC
	CEC, INES, Geology, Biology	6 Oct.	Prefects / Directors
	Physics and Chemistry	31 Oct.	Prefects
Faculty management	Bureau	1 Nov.	Interim report
	Management Council	8 Nov.	Interim report
Reconciliation meetings of the investigation	CEC Board of Directors	14 June 29 Sept. 25 Oct.	Reference group for the study
	CIG study	20 Sept. 24 Oct.	Reconciliation between investigations

## Annex 3. Description of CEC matrix organisations

### ClimBioSiS

ClimBioSiS was established as a profile area at Lund University 2022-06-23 by decision of the Vice-Chancellor (STYR 2021/2396) and linked to CEC. ClimBioSiS stands for Sustainable solutions in the climate change-biodiversity-society nexus. The profile area will be the basis for an application for faculty funding according to the intentions outlined in the Government's research proposal Research, freedom, future -knowledge and innovation for Sweden (prop.

2020/21:60), the forms of which have since been examined by Forte, Formas, the Swedish Research Council and Vinnova. Lund University intends to proceed with the profile area regardless of what happens with profile areas nationally.

ClimBioSiS focuses on identifying, critically evaluating and collaboratively stimulating nature-based solutions at the intersection of biodiversity, climate and society. The application for the profile area was submitted by 30 researchers at

- BECC (at six departments at N-fak and LTH)
- MERGE (five departments at N-fak and LTH)
- LUSEM (three departments of the School of Economics)
- EPRG (Environmental Policy Group at the Department of Political Science, S-fak)
- LUCSUS (an institution, S-fak)
- Environmental Psychology (one department, LTH)
- AI Lund (linked to the SFOs eSENCE and ELLIIT, faculty-wide)

The number of members is projected to be significantly higher. Currently, the area is led by Henry Smith (Coordinator), Emily Boyd (Deputy and Assistant Coordinator) and Paul Miller (Assistant Coordinator).

The area will be governed by a faculty-wide board, as well as a management group including the coordinators. Currently, ClimBioSiS has a budget of SEK 2 million per year 2023-2024 to work on the national application and organize the activities.

### BECC

The BECC strategic research area was launched in 2010. BECC stands for Biodiversity and Ecosystem services in a Changing Climate. BECC investigates the direct and indirect effects of climate and land use change on biodiversity and ecosystem services and its implications for management and policy. This is done by bringing together modelling, empirical ecology, economic and social science analysis and by integrating stakeholder experience into the research process.

BECC is an integrated knowledge environment that facilitates the integration of research with education and dialogue with society. BECC is a partnership between Lund University and the University of Gothenburg (GU), and is coordinated from LU.

BECC works closely with MERGE, together they have for example a user reference group and commitments within the ClimBEco research school. For the past two years, BECC, MERGE and ClimBEco have entered into a cooperation agreement with the Bolin Centre for Climate Research at Stockholm University.

The activities are managed by a coordinator and a board. At the GU there is a steering committee chaired by the deputy coordinator of the BECC Board. The Board is supported by an International Scientific Reference Group and a National Beneficiary Reference Group, which meet with the Board 1-2 times each year.

The budget for the financial year 2022 amounted to approximately 25 million in direct grants from the government, of which approximately 20 million to LU. In addition, BECC's research is conducted through faculty grants (salaries of participating researchers) and external grants from, among others, the research councils, MISTRA and authorities, funds that are linked to the departments where the research is conducted (a total of approximately 175 million at LU and GU).

Approximately 245 researchers are associated with BECC, of which 225 are at LU and 20 at GU. In addition, 95 research students are included: 75 at LU and 20 at GU. The directly associated administration consists of 3 HE distributed among 4 persons: 1 communicator, 1 research coordinator, 1 research administrator and 1 collaboration coordinator.

## **MERGE**

The MERGE strategic research area was launched in 2010. MERGE stands for Modelling the Regional and Global Earth system. The research community focuses on interactions between climate and terrestrial biosphere and the development and application of detailed process-based models, climate models and Earth system models. MERGE aims to stimulate innovation and inspire action by being a multidisciplinary hub that delivers world-leading data and knowledge in the field of climate-terrestrial biosphere interactions to the international Earth system modelling research community. MERGE consists of six partners: Lund University, Chalmers University of Technology, University of Gothenburg, KTH, Linnaeus University and the Rossby Center at SMHI. As mentioned above, MERGE collaborates closely with BECC with whom it has a joint user reference group, commitments within the ClimBEco research school, and a collaboration agreement with the Bolin Centre for Climate Research at Stockholm University.

The activities are led by a coordinator and a board and supported by two reference groups, one scientific and one with societal stakeholders, the latter shared with the BECC. The reference groups meet 1-2 times each per year.

The budget for the financial year 2022 amounted to SEK 10 million in direct grants from the government, of which approximately SEK 5 million will go to Lund University.

In addition, MERGE's research is conducted through faculty grants (salaries to participating researchers) and grants from external funding agencies, including Formas, VR, the Swedish Space Agency, EU Horizon, the Swedish Transport

Administration and the Swedish Environmental Protection Agency, funds linked to the institutions where the research is carried out (a total of about 100 million at LU).

A total of 148 researchers and 42 research students are currently (autumn 2022) part of MERGE, of which 66 researchers and 30 research students are working at LU. The administration consists of 0.5 HE distributed over three persons: a research administrator and two communicators.

### **ClimBEco**

The ClimBEco graduate school started in 2010. ClimBEco stands for Climate, Biodiversity and Ecosystem services in a changing world. The graduate school is focused on climate, biodiversity and ecosystem services, and has the explicit aim of contributing to the research of its doctoral students in a robust interdisciplinary and societal context. Activities will foster communication skills and the ability to collaborate across disciplinary boundaries within the academy. A mentoring programme matches doctoral students with a mentor inside or outside academia. Mentors can be alumni and are often well established in their respective fields. ClimBEco collaborates with the Bolin Climate Research School at Stockholm University and the SILVA research school at SLU.

The activity is managed by a coordinator and a steering committee that meets 2-4 times a year. The steering group consists of representatives from N-facility, BECC and MERGE.

The budget for the financial year 2022 amounted to SEK 2.2 million, the bulk of which consists of faculty grants and about 20% from BECC and MERGE.

Termination and re-enrolment are per academic year. In the spring semester 2022, 46 PhD students were admitted, in the autumn semester 2022, 33 PhD students were admitted. The administration consists of 1.1 HE divided into two persons: 1 coordinator at 90 % and 1 administrator at 20 %.

### **LU Land**

The thematic collaborative initiative LU Land – Land Use for a Sustainable Future, started in 2019 and is one of currently 18 thematic collaborative initiatives at Lund University. LU Land is an open platform in the field of sustainable land use, where different sectors, interests and research subjects jointly address the challenges posed by an increasing demand for products from agricultural industries, ecosystem services and land for infrastructure and settlements. LU Land spans the broad field of sustainable land use and includes production, planning and property rights issues, set in relation to policies and legislation aimed at steering towards a bio-based economy that meets climate as well as other sustainability and environmental objectives. This is done by researchers working with external stakeholders to both identify knowledge needs and synthesise existing research, and jointly create new interdisciplinary research projects. LU Land collaborates with 27 external organisations - including government agencies, regions, municipalities, interest groups, companies and research

institutes. 540 researchers and societal actors are currently registered in the network LU Land is governed by a steering group consisting of the initiative's two coordinators and seven theme leaders.

LU Land is funded by Lund University for three years with an annual budget of SEK 0.7 million. (a total of SEK 2.1 mill. which may be committed for four years due to the effects of the pandemic). In addition, there is funding of a total of SEK 0.4 million. from the Sustainable Business Hub and Region Skåne's Environmental Protection Fund.

73 researchers are directly linked to LU Land. The administration consists of 0.4 - 1 HE distributed among 1 project leader (0.4 HE), plus periodic temporary support to the project leader (0.25 plus 0.25 HE). Communication support is provided by the CEC.

### **Marine Centre**

The Marine Centre has been in existence since 2010, and was established as a research and innovation environment with Lund University in 2019. The aim of the strategic collaboration between Lund University and the Municipality of Simrishamn is to create a needs-driven, interdisciplinary platform at the Maritime Centre in Simrishamn, which through applied research and innovation development can help us solve current challenges in the Baltic Sea with a particular focus on the Hanö Bay. The FOI environment is characterised by interdisciplinary collaboration and direct contacts between researchers and society. There is cooperation with all the municipalities along the Hanö Bay, along Blekinge and the entire east coast of Skåne. The Marine Centre also has direct contacts with the Danish Maritime Authority and the Österlens VA.

The activities are managed by a steering group, including the director of the CEC and the mayor of Simrishamn. The steering group meets at least once a year. A collaboration group/FOI council with representatives from Lund University's appointed coordinators and academic councils, as well as representatives from the Marine Centre, provides ongoing support and input to the steering group for strategic decisions and budgeting. The FOI Council meets 2-4 times a year.

Marint Centrum has a total funding of 7 million over 5 years from Region Skåne's regional development board. The CEC co-finances all OH for staff and research projects located at the CEC, plus 10% of a full-time position for internal coordination/support. Other funding for research projects within the collaboration comes from, among others, the LMK Foundation and Formas.

Five researchers are directly linked to the collaboration. The administration is located at the Marine Centre, with 1.2 HE divided between an FOI coordinator and two coordinators. In addition, in-kind support (research initiation and management support) is provided by the CEC.

### **Sustainability Forum**

The Sustainability Forum was reformulated in 2014 from the Climate Initiative (which started in 2008) and worked on the basis of a three-year mission. The Sustainability Forum's cross-faculty mission from the Vice-Chancellor includes providing a strategic

support function to the University's core activities and line organisation to contribute to the realisation of the intentions of the Sustainable Development Strategy for LU 2019- 2026 (STYR 2017/1345). This is done by stimulating, promoting and integrating sustainable development in research, education, communication, student participation and interaction with the surrounding community. The assignment includes interacting with the central committees (research, education and postgraduate education), and providing support to the environmental manager and the internal environmental and sustainability work. The Sustainability Forum is a gateway to the University for external stakeholders, and has a long-term collaboration with, among others, Lund Municipality (Sustainability Week) and Region Skåne.

The activities are managed by a director and a steering committee. The Steering Group meets 4-6 times a year and has strategic responsibility for the Forum's activities. The operational work of the office is jointly managed by the Executive Director and the Director.

For the financial year 2022, the funding amounts to SEK 6 million. The bulk, SEK 4 million, is allocated through the University's resource allocation and targeted faculty funding, while a smaller part (about 30 percent) comes from targeted internal initiatives (Sustainability Week, research conference, workshop series, excellence initiative).

The Sustainability Forum has no directly affiliated researchers or graduate students. The administration consists of 3.5 HE + 1 HE for a limited time, distributed over 7+1 person: 1 director, 1 director of activities, 1 research coordinator, 1 communicator, 1 education coordinator, 2 student assistants, 1 project manager (for a limited time). For the organisation of university-wide activities, services are purchased as needed.

## Annex 4. CEC success factors and challenges

The following lists of items are the results of discussions and meetings held in the framework of the investigation.

### CEC success factors

- Networking in the form of multi-institutional college, CEC Fellows and associated matrix organisations
- CEC's core activities - research and education - have acted as a link and engine for business development
- Synergies between the activities of the traditional institutional missions and the matrix organisations, which have created a basis for initiative and a connective network
- CEC is a natural and accepted host for thematically relevant research and collaborative projects
- The potential to offer advanced project management support enhanced by being a workplace that allows for a learning process where methodologies can be developed and experiences exchanged, a potential that could not be fully exploited due to higher demand than availability of advanced project management support
- Communication support offered, which has the potential to be further developed as structured strategic communication initiatives
- Support for research initiation and proposal writing, underpinned by strong expertise in research impact, exploitation and societal relevance, as well as the creation of venues for launching new broad applications
- Consolidated operational administration leading to synergies
- Knowledge of forms of collaboration and a developed network with relevant societal actors
- Matrix activities that can give a great weight to a future large institution if organised within a centre formation under the CIG.

### The challenges of CECs

- Motivate colleagues across the University to invest the time needed, both to develop the business and to carry out specific tasks, for example linked to collaboration
- Meeting staffing needs to fill leadership roles and committees
- Have sufficient redundancy in the organisation to be able to take on rapidly emerging opportunities or manage existing assignments in the event of temporary staff shortages
- Clarity in management structures, with clear roles between the CEC Director/Board and other Directors/Coordinators/Steering Groups of activities/matrix organisations
- Organisation that takes advantage of the links between ClimBioSiS, BECC, MERGE and LU Land in a future organisation, in particular if, in the future, there is no network organisation and/or these are split up between different institutions

- Role division between the management of a future centre and the head of the host institution in a future organisation
- Providing appropriate facilities for interdisciplinary interaction, which requires physical facilities with space and room for staff and activities
- For graduate schools to balance their own operations and structure to cope with links to teachers, mentors and the private sector with links to research at the institutions involved
- For university-wide activities such as the Sustainability Forum, which are not specifically linked to CEC research, create synergies from proximity to other research coordinators and communicators
- Ensuring continuity of leadership
- Responsibility in the field of environmental science research and development?
- Managing strategic recruitment in a future organisation, to ensure interdisciplinarity in a future where a centre does not have its own academic staff or without weakening the networks if the centre has its own academic staff.

## Annex 5. Extract from RQ20

CEC was not evaluated as an organisation by Lund University's major Research Quality Evaluation Project 2020 RQ20, but researchers associated with CEC were part of a number of different Panels and the underlying Units of Assessment (UoA). This means that there is no overall analysis of the CEC. Parts of the CEC matrix organisation, specifically the SFOs, were evaluated in the Large and Interdisciplinary Research Environments (LIRA).

However, the fragmented nature of the evaluation means that the conclusions on CEC are few and contradictory. Here we highlight only those conclusions that are relevant to the Centre's activities.

### Panels Environmental Science and Biology

- “The Centre for Environmental and Climate Research (CEC) is an excellent research environment under strong leadership. Nevertheless, the Panel concluded that increased opportunities for collaborations in teaching and research across faculty borders should be facilitated and stimulated by the University to increase the centre's future potential.”
- “The support from Lund University is increasing and the University has taken a number of recent initiatives in sustainable development and interdisciplinarity, relevant to this UoA (Biodiversity and Ecosystem Services, our note). One example is that the current Faculty plan of action explicitly addresses interdisciplinarity and sustainable development. However, the Panel had the impression that navigating the University to take full advantage of efforts to support interdisciplinary research and education was sometimes difficult, and this should be a concern for the leadership of the University.”
- “CEC has also played a prominent role in advancing several environment and climate-related initiatives at the University. Examples include Hållbarhetsforum, which CEC is hosting, and Climate- KIC, LU-Land and the Research School Agenda 2030. CEC has also engaged in developing a sustainability strategy for Lund University. Together, these activities have fostered a healthy, outward-looking atmosphere at the UoA, stimulating new research and helping to develop new skills in communication of research.”
- “The self-evaluation stresses that the lack of critical mass in social sciences constrains the potential to develop cross-disciplinary, global- change research of high international standard. The Panel agrees with this insight and recommends that the UoA works actively to increase the number of affiliated or associated social scientists with complementary competences, e.g. through shared research positions between natural and social science departments. This sharing should not compromise the need for adequate intradisciplinary training and a thorough connection to the development of the research methods and tools within each discipline.”
- “The UoA has identified collaboration with Lund University Centre for Sustainability Science (LUCSUS) as a path to strengthen social science research. The Panel recommends that the University actively support such initiatives and commit to facilitate more interdisciplinary activities, including exploring the

potential for shared positions across faculties and departments, showing a commitment to the development of joint research projects and innovative research areas."

- "Faculty borders are a concern for multidisciplinary, not least teaching of joint courses. Involved faculties need to consider ways of facilitating the organisation of multidisciplinary teaching involving staff from social science and natural science departments."
- "The university would benefit from supporting and stimulating increased collaboration between CEC and LUCSUS."
- "...the Panel concluded that increased opportunities for collaborations in teaching and research across faculty borders should be facilitated and stimulated by the University to increase the centre's [CEC's] future potential."

### **LIRA reports**

"Overall we were impressed by the strength of the SRAs [SFO:er, vår anmärkning] at LU. We believe that the aforementioned observations, findings and recommendations provide a framework to further enhance their position over the coming years. Based on our review our concluding reflections are:

- SRAs are valuable and effective instruments for LU - keep the SRAs vibrant, dynamic and relevant
- Leadership should better embrace the SRAs - facilitate and integrate SRAs
- LU should improve its overview of academic output - collect data and make informed strategic decisions
- LU should better leverage its SRA success - raise LUs international standing"