INTRODUCTION

Short projects are a way to stimulate ideas and work from MERGE members within the MERGE research framework and as such cross-research between the different research areas (RA) are encouraged. The focus is often derived from discussions and ideas that are raised during the annual meetings of MERGE blended with input from our external monitoring. During the 2024 MERGE Annual Meeting, our members identified knowledge gaps and strategic opportunities critical to MERGE's research agenda. These priority topics are outlined in Appendix 1.

To foster research and collaboration in these areas, MERGE invites proposals for short projects (SPs) with a duration of up to 12 months and a maximum funding of 300,000 SEK. MERGE will fund up to two SPs during this cycle.

Timeline:

- Call opens: 10 April
- Application deadline: 5 June
- Evaluation and decision: September 2025

Who can apply?

The principal application must be a MERGE member and hold a PhD degree. All participating members must be MERGE members, you may apply for membership here MERGE membership | MERGE.

What can be applied for?

- Short, self-contained projects
- Pilot projects
- Workshops
- Mobility

Salary costs (including overhead) can only be covered for personnel employed at Lund University or the University of Gothenburg. Travels, hotel stays etc. can be covered for all MERGE members.

Examples of expected outcomes

- Review paper
- Research paper
- Scientific report from a pilot project that can lead to a larger grant application

Evaluation criteria

The applications will be evaluated based on three criteria:

- Relevance to MERGE's priorities and identified knowledge gaps, as outline in Appendix 1.
- Scientific quality and feasibility.
- Potential for broader outcomes, including fostering new collaborations, engaging stakeholders, supporting career development, and enabling future initiatives.

APPLICATION INSTRUCTIONS

- The main application must not exceed **three A4 pages** (excluding references)

- Name your document using the short project title
- Submit two separate files:
  - Main application document as a PDF or DOCX file
  - Budget (fullkostnadskalkyl) as an XLSX
- Email the application to lina.nikoleris@cec.lu.se

Your application should contain the following sections and information:

1. TITLE

Provide the full title of the project. Also include the short project title while naming this document.

2. PROJECT MEMBERS

List all project members and include a brief description of their roles. Please consider gender aspects.

3. PURPOSE AND AIM

Describe the project with its main aim. List the objectives you expect to achieve in a bullet point format. For inspiration, please see Appendix 1 for a list of points discussed at recent meetings.

4. ACTIVITIES AND SCIENTIFIC DESCRIPTION

Provide a scientific description of the project, including a short background, data and methods, planned activities, and time frame.

Specify the proposed period of funding (maximum 12 months) using the format: mm/yy – mm/yy.

5. OUTCOMES

List the intended outcomes in a bullet point format. If the outcomes are papers and presentations at conferences, please make sure to acknowledge MERGE, and include the MERGE logo in presentations. A MERGE PowerPoint template is available and may be used for this purpose: https://www.merge.lu.se/sites/merge.lu.se/files/2023-11/MERGE%20ppt%20template.pptx

6. RELEVANCE TO MERGE RESEARCH AREAS

Describe the relevance of the SP to MERGE research areas (RAs). New SPs should first be discussed with one or more of the MERGE RA leaders (see Appendix 2).

7. INTERDISCIPLINARY LINKAGES AND STAKEHOLDER PARTICIPATION.

Describe the interdisciplinary linkages and the involvement of stakeholders in the project. Proposals that promote interdisciplinary collaboration, actively engage stakeholders, and include contributions from different MERGE partners—Lund University, University of Gothenburg, Rossby Centre/SMHI, KTH and Chalmers—are highly encouraged. Initiatives led by early-career researchers are particularly welcomed. Please consider how gender aspects are integrated into the project to promote diversity and inclusivity.

8. RESOURCES NEEDED

Attach a detailed budget (Swedish: fullkostnadskalkyl) that includes salaries (with social security costs), premises, indirect costs, and other direct costs. The budget must be signed by your department or division head. Use the template "*Fullkostnadskalkyl för 5 år"* (English or Swedish version), available at: https://www.ekonomiwebben.lu.se/mitt-arbete/projektansokan-och-projektredovisning/mallar-projektkalkyler

In the main application, provide clear motivation for the direct costs.

The maximum budget for MERGE SPs is 300,000 SEK, including overhead. Eligible costs include:

- Salaries at Lund University and University of Gothenburg.
- General running costs (meetings, travels to meetings, printing, catering etc.) up to 100,000 SEK.

9. ADMINISTRATIVE INFORMATION

Include and complete the following information:

Host department that will administer the funding:

Date:

Signature of main applicant:

Signature of host department or division head:

10. REFERENCES

Appendix 1

Identified Topics & Knowledge Gaps

At the 2024 MERGE Annual Meeting our members discussed and identified the following knowledge gaps within the three topics of the meeting.

Machine learning (ML)

- Where machine learning can be (further) developed:
    - Now limited capacity to extrapolate
    - Active exploration or areas where we lack data
    - Feedback between data acquisition and modelling
    - Causality, there are recent ML methods that can test for causality.
    - Sensitivity analysis constraints
    - Projects or testbeds who are already using different pathways/technologies of AI in their research or are planning to apply them, from Random Forest to Deep Learning.

Linking small and large models

How to deal with computational time (regional & global models), and/or dealing with time scales relevant to different processes in coupled models

Humans and society in the climate system

- Social Climate Models (SCMs) could eventually replace IAMs, projects that try out coupling to society and with some kind of human boundary would be interesting to develop and test.
- Emission-driven ESMs will be more standard in CMIP7
- It is claimed that SCMs, by superseding the SSP framework, could eventually reduce the uncertainties in future climate projections. If so, it would be good if MERGE was well placed to contribute to the development and analysis of SCMs in future
- Analysis if the models gain credibility by adding more layers of complexity as well as discussions (workshop) around more freedom in the models make simulations more difficult to compare, as opposed to standard scenario-driven simulations.

Examples of how MERGE members could contribute to these topics:

- In a Social Climate Model (SCM), MERGE could contribute with detailed descriptions of climate extremes and how these influence people and ecosystems (e.g. crop yields), but also how wildfires and BVOC emissions influence air quality – all of which could influence the Cognition and Behavioural Response aspects detailed in Beckage et al.
- Funded SCM-related ideas are encouraged to include a high-level workshop or seminar with international speakers to explore the potential of SCMs and for MERGE contributions to them. Note that MERGE researchers already collaborate with Brian Beckage.
- Mathematicians could apply dynamical systems theory to analyse simpler SCMs
- The creation of an Short Project with the aim to initiate regular activities, discussions and work with linking models, ex webinars or seminarserie.
- Projects in which heuristic/empirical parameterizations, components or models are identified as candidates to be replaced with neural networks instead since these will be faster and can include some amount of physics, e.g. in LPJ-GUESS and aerosol models
- Projects in which SMHI data or ICOS/ACTRIS data are used in a ML setting.
- SPs with connection to ELLIIT, eSSENCE are encouraged, through common interests/ finding common ground with Machine learning/AI

Appendix 2

Research area leaders

RA1: Development, modelling and evaluation of climate-vegetation processes
– Benjamin Smith (benjamin.smith@nateko.lu.se), Klaus Wyser (klaus.wyser@smhi.se)

RA2: Past variations in climate and vegetation
– Jesper Sjolte (jesper.sjolte@geol.lu.se), Hans Linderholm (hansl@gvc.gu.se)

RA3: Vegetation, emissions and particles
– Mattias Hallquist (hallq@chem.gu.se), Moa Sporre (moa.sporre@nuclear.lu.se)

RA4: Advanced statistics for model evaluation, simulation set-up and analysis
– Johan Lindström (johan.lindstrom@matstat.lu.se)