

Renewal Proposal for the Penn State Center for Climate Risk Management (CLIMA)

<http://clima.psu.edu>

Submitted to the Earth and Environmental Systems Institute

by

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Summary

The Center for Climate Risk Management (CLIMA) was established 12 years ago with broad support across colleges and institutes to catalyze interdisciplinary research, education, and outreach in the area of climate risk management. CLIMA has achieved these goals through four main activities: (i) leading the development and running of large and successful proposals (e.g., a cooperative agreement with NSF to establish a [Network for Sustainable Climate Risk Management \(SCRiM\)](#), the NOAA-supported [Mid-Atlantic Regional Integrated Sciences and Assessments \(MARISA\)](#)), (ii) helping provide and support new open source tools (e.g., [to assess long-term flood risks](#)), (iii) community building (e.g., through co-supporting a seminar series and small workshops), (iv) outreach (e.g., a professionally designed and maintained [webpage](#)), and (v) supporting new research initiatives in areas such as [resilient communities](#) and [energy system transitions](#) (many of which are led by [junior faculty](#)). CLIMA has enabled a considerable growth of the resource base as well as the international recognition of climate risk management at Penn State. Here we request continued use of space and administrative support within EESI, as well and financial support of \$7k/yr to sustain and further expand CLIMA's scale. These funds are leveraged by sizable existing research grants.

CLIMA-supported research, education, and outreach will continue to increase Penn State's ability to compete for new external grants in the rapidly growing field of climate risk management. CLIMA also addresses a question of increasing importance to the University's Sustainability Institute (as well as federal and industry funding programs), the University's strategic plan, and provides a tool for recruiting top-quality students and faculty. CLIMA-supported research has also started to help with development activities in the College of EMS and beyond.

List of current CLIMA Associates, their Departments, and Colleges

(Co-)Directors that form the leadership team are in bold font

David Abler	Agricultural Economics, Sociology and Education, Agricultural Sciences
Richard Alley	Geosciences, Earth and Mineral Sciences
Saurabh Bansal	Supply Chain and Information Systems, Business
Seth Blumsack	Energy and Mineral Engineering, Earth and Mineral Sciences
C. Daryl Cameron	Psychology, Liberal Arts
Guido Cervone	Geography, Earth and Mineral Sciences
Jamison Colburn	Penn State Law
Shannon Cruz	Communication Arts and Sciences, Liberal Arts
Kenneth Davis	Meteorology and Atmospheric Science, Earth and Mineral Sciences
Richard Duschl	Curriculum and Instruction, College of Education
Jenni Evans	Meteorology and Atmospheric Science, Earth and Mineral Sciences; ICDS
Darryl Farber	Science, Technology, and Society, Engineering and Liberal Arts
Karen Fisher-Vanden	Agricultural Economics, Sociology and Education, Agricultural Sciences
Chris Forest	Meteorology and Atmospheric Science, Earth and Mineral Sciences
Lara Fowler	Penn State Law; Institutes for Energy & the Environment
Caitlin Grady	Civil and Environmental Engineering, Engineering; Rock Ethics Institute
Helen Greatrex	Geography, Earth and Mineral Sciences; Statistics, Science
Murali Haran	Statistics, Science
Lisa Iulo	Architecture, Arts & Architecture
Armen Kemanian	Plant Science, Agricultural Sciences
Klaus Keller	Geosciences, Earth and Mineral Sciences, Center Director
Andrew Kleit	Energy and Mineral Engineering, Earth and Mineral Sciences
Michael Mann	Meteorology and Atmospheric Science, Earth and Mineral Sciences
Robert Nicholas	Earth and Environmental Systems Institute, Earth and Mineral Sciences
Wei Peng	School of International Affairs, Civil and Env. Engineering, Engineering
David Pollard	Earth and Environmental Systems Institute, Earth and Mineral Sciences
Mark Roberts	Economics, Liberal Arts
James Shortle	Agricultural Economics, Sociology and Education, Agricultural Sciences
Janet Swim	Psychology, Liberal Arts
Erica Smithwick	Geography, Earth and Mineral Sciences
Ming Xiao	Civil and Environmental Engineering, Engineering
Jiro Yoshida	Risk Management, Business
Nancy Tuana	Philosophy, Liberal Arts; Rock Ethics Institute
Mort Webster	Energy and Mineral Engineering, Earth and Mineral Sciences
Katherine Zipp	Agricultural Economics, Sociology, and Education, Agricultural Sciences

The Challenge

Unmanaged anthropogenic climate change poses serious risks. One vital question is how to manage these climate risks with approaches that are scientifically sound, economically viable, socially accepted, and ethically defensible. Funding agencies increasingly recognize the importance of mission-oriented basic science to inform this question. Recognition of the need for interdisciplinary research in this area translates into new and expanding funding availability, combined with an increase in the complexity and interdisciplinary nature of the research. Consider, as examples, the recent increase in publications (as well as private and public funding) in areas such as (i) adaptation to sea-level rise, drought, and riverine flooding (ii) climate mitigation through carbon sequestration, or (iii) geoengineering. Analyses of these issues that neglect the interdisciplinary interactions (e.g., between scientific uncertainty, public understanding and response, as well as the economic and ethical implications) necessarily miss key aspects of the problem. Strong institutional support for interdisciplinary research is one compelling competitive advantage of Penn State. In addition, Penn State has the critical mass of researchers with the expertise to analyze and support climate change decision-making.

What does CLIMA do?

- (i) CLIMA promotes transdisciplinary and inter-college interactions in a cutting-edge field by linking researchers across colleges within Penn State and by enabling Penn State to take a leading role worldwide in the critical emerging field of climate risk management.
- (ii) CLIMA catalyzes new research collaborations through a co-sponsored seminar series, developing and supporting access to crucial research tools, and supporting new initiatives in strategic areas such as climate and health, energy system transitions, or resilient communities.
- (iii) CLIMA helps to secure new funding and helps to sustain and leverage existing funding for interdisciplinary and multi-PI projects by supporting grant writing, providing tools, and supporting exploratory research that produces preliminary results that considerably improve grant proposals.

What has CLIMA achieved in the last three years?

In the last three years, CLIMA has primarily focused on **growing and sustaining external research support**. Examples of key successes in this area include:

- Supporting and leveraging the [Network for Sustainable Climate Risk Management](#) (SCRiM, PI Keller). SCRiM was a NSF cooperative agreement that was centered at Penn State and linked 18 universities and five research institutions in six nations.

- Supporting and leveraging a project on A Multi-Model, Multi-Scale Research Program in Stressors, Responses, and Coupled Dynamics at the Energy-Water-Land Nexus and for Concentrated, Interdependent Infrastructures (PCHES, PI Fisher-Vanden).
- Supporting and leveraging a NOAA RISA project: “Mid-Atlantic Consortium for Climate Assessment and Decision Support ([MARISA](#)) (lead PIs jointly Knopman at RAND and Keller at Penn State with an overall budget of \$3.6 million over five years, as well as a synergistic Coastal Climate Extension Program for the Chesapeake Bay Region (PI Nicholas).
- Supporting and leveraging NSF proposal and now project on “[Visualizing Forest Futures \(VIEFF\)](#)” (PI Smithwick) that combines many tools and methods developed with CLIMA co-support.
- Research groups at PSU, other U.S. institutions, and beyond are adapting and leveraging tools developed with CLIMA co-support. One key example includes simple coupled models of the carbon cycle, temperature changes, and flooding risks that have been ported to new software platforms and are now being integrated into many cutting-edge integrated assessment models of climate change¹.
- Establishing working versions of models and tools on Penn State high performance computing systems.
- Co-supporting the [Climate and Sustainability Ethics](#) Initiative of the Rock Ethics Institute
- Co-supporting the fall 2019 Earth talks series on the *Dynamics of Deep Decarbonization*.
- Co-supporting the Penn State Power and Energy Systems Transitions Laboratory ([PESTL](#)).
- Co-supporting the Penn State Initiative of Resilient Communities ([PSIRC](#)).

CLIMA **supports capacity-building on campus** by co-sponsoring a [seminar series](#) to bring people together and catalyze new collaboration. CLIMA is also leveraging other funds by co-sponsoring speakers with topics relevant to climate risk management.

CLIMA researchers are part of efforts to **develop educational programs and resources**. For example, CLIMA resources co-supported the development of a [summer scholars program](#) and a [summer school](#) that are internationally advertised. Ongoing research is developing teaching materials for K-12 students.

¹ Wong, A., & Bakker, A. <https://github.com/scrim-network/BRICK>.

In addition to invited talks, web resources, and contributions to the IPCC, etc., CLIMA researchers **contribute to outreach** through focused on interactions with decision makers and stakeholders facing challenging climate change adaptation problems, for example on inland and coastal flood-risk management (funded, for example, by NOAA).

What are funding opportunities?

There is a substantial and quickly growing support for mission-oriented basic science relevant to climate risk management (see, for example, the summary of just a subset of CLIMA related grants detailed above). Research and education in the area of climate risk management is supported, for example, by NSF, NASA, DOE, and NOAA, foundations, and industry. The proposed activities will increase the competitiveness for these funding opportunities. Specific examples of existing funding opportunities that CLIMA will continue to pursue include:

- [NSF: Decision, Risk and Management Sciences](#)
- [NSF: Dynamics of Integrated Socio-Environmental Systems \(CNH2\)](#)
- [NSF: Growing Convergence Research \(GCR\)](#)
- Philanthropic and Industry support (in collaboration with the development office of EMS, the Sustainability Institute, and Old Main).

Perhaps more importantly, CLIMA has and will continue to improve the competitiveness of Penn State to secure larger-scale research grants.

Relationship to university-wide initiatives

CLIMA provides key building blocks for several university-wide initiatives as well as support for a network that links these building blocks. Consider, for example, the CLIMA-supported work in the areas of integrated assessment modeling and risk analysis that provides infrastructure that can be used by faculty across campus to evaluate the impact of new energy systems on climate risk.

CLIMA is a key foundation for many externally funded research, education, and outreach activities (see discussion above). CLIMA provides a stable base that catalyzes synergies between these externally funded activities, supports proposal writing, provides long-term name recognition, and keeps key parts of the network alive during the often-necessary transitions between larger grants.

Where do we go from here?

Research on climate risk management has gained considerable momentum at Penn State over the last few years. The strategic investments through CLIMA have enabled much of the community as well as the tool building that were crucial factors in this success. We

plan to continue on this path by:

1. sustaining existing and pursuing new larger and more complex research grants,
2. expanding to more fully integrate ethical analysis of climate change adaptation and geoengineering strategies, and
3. expanding the analysis of climate change adaptation strategies.

Management Structure

An executive committee of three (Keller, Nicholas, and Tuana) handles the day-to-day management tasks. This committee meets typically biweekly (coordinated with project meetings). Decisions are made by a majority vote. Main strategic questions are coordinated with the full set of co-directors that comprise the leadership team.

Center Needs / Budget

We request EESI funds of \$7k/year. The projected fund allocation is shown in Table 1. In addition to these institutional resources, CLIMA is leveraging existing external funds of tens of millions of US\$.

Table 1: Projected budget allocation (averaged over the three-year funding cycle)

Activity	Allocation [\$ per year]
Postdoc / Research associate co-funding	\$1,000
Programmer co-funding	\$1,000
Staff Assistant co-support	\$1,000
Travel to support proposal development	\$1,000
Seminar series and guest speakers	\$1,000
Materials and Supplies	\$1,000
Total	\$7,000

These funds are designed to support the preparation of new proposals. We cannot move this support to external funds. The point is that we want to facilitate the translation of new ideas that are, thus far, not supported by external funds into preliminary results that then can be used to secure new funds.

Expense summary over the last three years

CLIMA received PSU funds of \$47,194 total over the last three years. Most of these funds have supported, thus far, salary/wage (42%), computer equipment/software (25%), travel (21%), seminars/workshops (7%), and materials and supplies (5%). Details are provided in Appendix 5.

Attachments/Appendices

- (1) Short CV of the current center director
- (2) Letter of Support from Karen Fisher-Vanden, Co-Director of Energy and Environmental Economics and Policy Initiative (EEEPI)
- (3) Letter of Support from Wei Peng, Assistant Professor, School of International Affairs and Department of Civil and Environmental Engineering, joining the CLIMA leadership team
- (4) Letter of Support by Lisa Iulo, Co-Director of the Penn State Penn State Initiative for Resilient Communities, Director Hamer Center for Community Design, joining the CLIMA leadership team
- (5) Detailed expense summary