NATIONAL SCIENCE FOUNDATION
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NSF 21-103

Dear Colleague Letter: NSF/NSFC Joint Research on Sustainable Regional Systems

July 13, 2021

Dear Colleagues:

The NSF Engineering Directorate (ENG) and the National Natural Science Foundation of China (NSFC) Department of Interdisciplinary Sciences are partnering to encourage joint research by U.S. - China teams collaborating on fundamental research on Sustainable Regional Systems (SRS).

Among nations, the U.S. and China have the two largest economies on Earth and also have significant engineering, technology, business and trade relationships with each other. Both nations face significant environmental sustainability challenges, for example, urban sustainability, global change, and manufacturing. Fundamental research is needed to provide the foundational knowledge for addressing these challenges.

This call is for research proposals from joint U.S. - China teams on Sustainable Regional Systems:

"Sustainable Regional Systems (SRS: U.S.-China)"

- advance sustainable regional systems science, engineering, and education to facilitate the transformation of current regional systems to enhance sustainability.

Every proposal must include the participation of researchers from at least one U.S. institution and at least one institution in China. Proposals that do not comply with this requirement will be returned without review. The proposal submitted to NSF must conform to NSF proposal requirements as specified in the NSF Proposal & Award Policies & Procedures Guide (PAPPG), and the matching proposal submitted to NSFC must conform to requirements posted by NSFC. NSF will fund the U.S. researchers of proposals selected for funding (up to a total of $500K for 4 years for each selected proposal), while NSFC will fund the China researchers of these selected proposals (up to a total of 3 million yuan for 4 years for each

selected proposal). In total, no more than 6 joint NSF-NSFC project grants are expected to be funded. Each proposal must include a management plan that clearly specifies the role of team researchers from both the U.S. and China, and the mechanisms through which close collaboration will be assured. The management plan is not to exceed 3 pages and is to be included in the supplementary document file of the electronic submission.

INTRODUCTION

More than half the world's population lives in urban centers, a trend that is expected to add 100 million new inhabitants to U.S. cities[1] and 255 million new inhabitants to Chinese cities by 2050[2]. The increase of urban inhabitants is likely to change and potentially strain the networks of connected communities that exist across the world. Urban systems are dependent on rural systems for the provisioning of food, energy, water, and other materials and natural resources, while rural systems are dependent on urban systems for markets, manufactured goods, and medical resources. These systems are also connected by ecological processes that both influence and are influenced by human behavior. Networks of urban and rural systems make up a dynamic, symbiotic system with complex social and physical interactions. To support prosperous, sustainable, and resilient regional systems, the complex variables and smaller systems that are operating within and across these communities need to be considered. Sustainable Regional Systems (SRS) are therefore connected urban and rural systems, including all systems in between, designed to measurably transform their structures and processes collaboratively to measurably and equitably advancing the well-being of people and the planet.

The goal of the "Sustainable Regional Systems (SRS: U.S.-China)" initiative is to fund convergent research and education that will advance sustainable regional systems science, engineering, and education to facilitate the transformation of current regional systems to enhance sustainability. Convergent Research is defined as research that is a) driven by a specific and compelling problem and b) requires deep integration across disciplines.

Advancing SRS science, engineering, and education requires intentional integration across three perspectives from regional to global scale:

- The study of single urban systems/metropolitan regions and their connected rural systems where multiple sustainability outcomes are addressed from a multi-scale systems perspective that connects homes, businesses, and communities at regional and global scales.
- The study of multiple urban systems and their connected rural systems, exploring inter-relationships among networks of urban and rural systems, and identifying urban-rural typologies for the study of cohort groups and comparison groups.
- The study of supra-aggregations of connected urban-rural systems, e.g., of all urban-rural systems in an electrical grid region, a nation, a world region, or the world, to

assess the collective impact of urban-rural transformation on people and the planet.

While all three of these perspectives include both urban and rural systems, it is important to note that a research project does not have to have an equal emphasis on the urban and rural systems of study, nor does it necessarily have to span all three perspectives. However, a successful research proposal will have a consideration of the urban and rural systems and perspectives that are relevant to the research questions.

Within each of these perspectives, integration of the following key elements could significantly advance SRS science: new data, methods, and models to understand interactions between natural, human-built, and social systems; improved understanding of interdependencies, mutual benefits, and trade-offs of different wellbeing outcomes for humans and the environment; new and generalizable theories of change relevant to SRS; the co-production of knowledge; and/or exploration of concepts of social equity in sustainable regional systems across spatial and temporal scales.

Examples include, but are not limited to, harnessing renewable energy resources, addressing water quality and supply, improving sensing and chemical analytics, developing recyclable/upcyclable plastics, reducing vulnerabilities of chemical and material supply chains supporting healthy environments, and conserving biodiversity, while enhancing human well-being and economic vigor in regional settings. Proposers may frame their networks around issues or topics important to the sustainability of regional systems, e.g., coastal urbanization, urban heat islands, food systems, energy, biodiversity, essential ecosystem services, mitigation of or adaptation to global change, public health, transportation, or governance.

Research must focus on identified urban and rural systems that include closely coupled regions beyond their boundaries. Regions should be clearly defined by the proposer, including the various components that make up the regional system(s) to be studied and the major topics that will frame the goals of the project that will lead to a more sustainable regional system or systems. Proposals must present compelling plans to advance use-inspired convergent research that has high potential for significant societal and sustainability impacts. Proposals must also describe plans for developing a deeper understanding of regional systems as integrated social-environmental-technological systems and to improve education related to SRS. As urban systems and their connections to rural areas grow, it is imperative that current and future social, engineered, and natural systems and infrastructure are maintained, planned, and implemented to adapt to this increase in population.

PROPOSAL SUBMISSION

U.S.-based researchers, through their U.S. institutions, may submit unsolicited proposals to collaborate with China-based researchers on the SRS topic described above to the ENG/CBET Environmental Sustainability (7643) program. The proposals must be received by

5:00 p.m. submitter's local time on January 17, 2022. Please note that, even though the Environmental Sustainability program has no submission deadline, proposals submitted for consideration under this DCL MUST come in by the January 17, 2022 deadline. More information on submittal procedures is posted at: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505695.

Each U.S. - China team is responsible for ensuring that their counterpart submits a matching proposal to the counterpart's funding agency by the required deadline. Each submitted proposal must include a letter from the collaborator. For NSF proposals, the collaborator letter is to be included in the supplementary documents file of the electronic submission, along with the management plan described earlier.

REVIEW AND AWARD PROCESS

The review and award process will follow NSF and NSFC guidelines specified in their respective policy documents. NSF and NSFC will conduct separate reviews of eligible submitted proposals in accordance with their review policies and regulations. NSF and NSFC will reach consensus, through discussion, on which projects are high enough priority to both sides to warrant joint funding. NSF and NSFC will make awards to the U.S. and Chinese institutions, respectively.

Questions concerning this opportunity may be emailed to the CBET Environmental Sustainability program director, Bruce Hamilton (bhamilto@nsf.gov), or the CBET Integrative Activities program director, Brandi Schottel (bschotte@nsf.gov).

Sincerely,

Linda Blevins
Assistant Director for Engineering (Acting)

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[1] Cutter, S. L., W. Solecki, N. Bragado, J. Carmin, M. Fragkias, M. Ruth, and T. J. Wilbanks (2014): Ch. 11: Urban Systems, Infrastructure, and Vulnerability. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 282-296. doi:10.7930/J0F769GR.

[2] United Nations, Department of Economic and Social Affairs, Population Division (2019). World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420). New York: United Nations.