



NATIONAL SCIENCE FOUNDATION  
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ALEXANDRIA, VIRGINIA 22314

NSF 21-019

## Dear Colleague Letter: Strengthening American Infrastructure (SAI)

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November 3, 2020

Dear Colleagues:

The National Science Foundation (NSF) - through its Directorates for Social, Behavioral, and Economic Sciences (SBE), Engineering (ENG), Computer and Information Science and Engineering (CISE), Mathematical and Physical Sciences (MPS), Geosciences (GEO), Biological Sciences (BIO), Education and Human Resources (EHR), and the Office of Integrated Activities (OIA) - seeks to stimulate fundamental exploratory, potentially transformative research that strengthens America's infrastructure. Effective infrastructure, whether it be physical, cyber, or social, provides a strong foundation for socioeconomic vitality and broad quality of life improvement. Strong, reliable, and effective infrastructure spurs private-sector innovation, grows the economy, creates jobs, makes public-sector service provision more efficient, strengthens communities, promotes equal opportunity, protects the natural environment, enhances national security, and fuels American leadership. To achieve these goals requires expertise from across the science and engineering disciplines. In particular, knowledge of human reasoning and decision making, governance, and social and cultural processes are essential to efforts to envision, build, and maintain an effective infrastructure that improves lives and society and builds on advances in technology and engineering.

This Dear Colleague Letter (DCL) invites workshop and Early Concept Grants for Exploratory Research (EAGER) proposals that incorporate scientific insights about human behavior and social dynamics to better develop, design, build, rehabilitate, and maintain strong and effective American infrastructure. (Workshops associated with this DCL are identified as Conference proposals in the [NSF Proposal & Award Policies & Procedures Guide](#) (PAPPG) and will hereafter be referred to as "conferences.") The DCL is intended to support exploratory work, in its early stages, on untested but potentially transformative research ideas or approaches that can identify and help build this new area of research. The activities NSF hopes to stimulate with this DCL may be considered especially "high risk - high reward" in the

sense that the Foundation seeks radically different approaches, application of new expertise, or engagement of novel disciplinary or interdisciplinary perspectives.

## **BACKGROUND**

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When people rent or purchase a home, register to vote, enroll their children in school, or check their cellphones for warnings of an impending storm, they rely on critical infrastructure. Businesses rely on critical infrastructure to acquire loans and communicate with customers, and to protect their security and assets. Cities, towns, and rural and tribal areas rely on extensive networks of a built and civic infrastructure. And scientific progress depends on a substantial research ecosystem infrastructure. Strong, effective infrastructure stimulates innovation and job growth, enables discovery and generation of new knowledge, provides safety and security, improves quality of life, and facilitates community welfare for many years into the future.

Many infrastructure projects entail extensive planning and large initial costs. Substantial initial infrastructure investments are worthwhile to the extent they provide long-term benefit and meet the needs of all people for a range of functions. Building such effective infrastructure requires understanding economic and social dynamics, and the perceptions and choices of many diverse individuals and communities. Whether involving transportation, security, health, education, communication, or other essential services, infrastructure design that puts people and social welfare first, is more likely to gain public support, to function more effectively, and to be less expensive to build and maintain.

The large costs and potentially large benefits of infrastructure investments mean that it is essential for people who build or maintain infrastructure to understand and incorporate relevant human and social factors in the earliest stages of design. For example, transportation infrastructure to support automated vehicles will require advance knowledge of economic and social structural influences on people's transportation choices, as well as human perceptual and cognitive responses in a wide range of critical decision-making and task-switching scenarios. Infrastructure developed to expand economic opportunity is likely to be more effective if it takes into account recent evidence concerning explicit and implicit human biases, as well as from discoveries regarding how social structures affect opportunity across social groups. Infrastructure designed to increase the speed and effectiveness of disaster response will work more effectively if its design is informed by often complex cultural and human trust contingencies and differences in group access to response resources. Healthcare and other public infrastructure that is reliant on the provision of fast and accurate information will be more effective if built from a knowledge base that includes dynamics of how people process information and misinformation and how this changes under stress, as well as how social constraints foster or inhibit use of such infrastructure. How people interact with their environment is critical to understanding consequences of large-scale infrastructure projects such as highways, dams, or levees.

## SUMMARY OF OPPORTUNITY

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With this DCL, the NSF seeks to build research capacity that can address these and many other challenging infrastructure contexts that require a human- and-social-centered approach. NSF anticipates nurturing and growing a research community in SAI over the longer term. This DCL constitutes the first step in that direction. We invite conference and EAGER proposals that will bring together experts across disciplines to support substantial and potentially pathbreaking, untested fundamental research grounded in user-centered concepts and offering the potential to substantially improve or transform the design, use, development, cost-effectiveness, or maintenance of U.S. infrastructure. These proposals should include a central focus on at least one SBE program area with the lead PI being an expert in social, behavioral, or economic science. Proposals must also demonstrate an interdisciplinary approach beyond that of any single Program or NSF Directorate.

**NSF is particularly interested in proposals that integrate a deep understanding of human cognition, perception, information processing, decision making, social and cultural behavior, legal frameworks, governmental structures, and related areas into the design, development, and sustainability of infrastructure.** Infrastructure may be of any kind, including cyber, economic, educational, physical, and social.

NSF is also interested in proposals that include development of new or improved performance metrics that can help stakeholders more effectively and efficiently assess infrastructure usability, cost-effectiveness, sustainability, resilience, and adaptability to changing circumstances.

NSF welcomes proposals that include efforts to broaden participation of underrepresented groups (women, minorities, and persons with disabilities) in the development of the research agendas. Proposals from MSIs are encouraged, as are opportunities for participation by undergraduate and graduate students and postdoctoral fellows, K-12 students, industry representatives, and others. Public-private partnerships can also be proposed for conferences.

## PREPARATION INSTRUCTIONS

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Proposals should reflect novel interdisciplinary and cross-Directorate approaches; however, each proposal submitted in response to this DCL must be grounded in a human- and/or social-centered approach to designing, building, and sustaining infrastructure. To facilitate effective review, proposal titles for conferences must begin with "**Conference: SAI**," and proposal titles for EAGERS must begin with "**EAGER: SAI**." Proposals of either type should identify both the relevant SBE program area(s) and the specific infrastructure that is being addressed; proposals must be submitted to the SAI Program (PD 21-145Y).

Proposals submitted in response to this DCL should be prepared and submitted in accordance with the guidelines contained in the most recent [PAPPG](#).

## CONFERENCE PROPOSALS

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Conference proposals submitted in response to this DCL must be submitted by **November 30, 2020**. Initial inquiries to [NSF-SAI@nsf.gov](mailto:NSF-SAI@nsf.gov) are encouraged to determine fit. Awards funded in this category will provide support for a period of one year and may be requested at a level not to exceed \$50,000 for the total budget (including indirect costs). Proposers should clearly outline how the conference activity will contribute to developing novel potentially transformative interdisciplinary research, the participant groups, anticipated target audience to be engaged and the plan to disseminate the findings after the conference(s). Convening events can take the form of conferences or other types of meetings and can include multiple sequential events. See [PAPPG Chapter II.E.7](#) for specific instructions about preparing Conference proposals. Conference proposals must be submitted via FastLane or Grants.gov.

## EAGER PROPOSALS

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Prior to submission, potential research teams are required to send a research concept outline, including project title, team members, institutions involved, and a summary of the project concept (up to two pages) by email to [NSF-SAI@nsf.gov](mailto:NSF-SAI@nsf.gov). To ensure proper processing, the subject line of the initial email inquiry should begin with: "**EAGER: SAI-E**". Concept outlines should be submitted by **December 11, 2020** (earlier if possible). NSF Program Directors will review the research concept outlines and will authorize those that fall within the scope of this DCL for submission of a full EAGER proposal. Proposals submitted without written authorization from an NSF Program Director will be returned without review.

Full proposal submissions are due **January 15, 2021** and will only be accepted if accompanied by written (email) authorization to submit (obtained in response to the research concept outline). Proposers should upload the email documentation from the NSF Program Director in the Supplementary Documents section of the proposal.

EAGER proposals in response to this DCL should adhere to the following guidelines.

1. Research teams should show demonstrated expertise in the SBE sciences and at least one of the research areas represented by other participating directorates (ENG, CISE, GEO, MPS, BIO, EHR, and OIA) related to infrastructure. An individual may participate as a PI or co-PI in only one EAGER proposal pursuant to this DCL. However, individuals named as a PI or co-PI in an EAGER proposal may also participate in one or more Conference proposals.
2. Proposals should describe how each participating discipline will contribute to intellectual merit and broader impacts for strengthening American infrastructure. The research

should be interdependent and integrated, contribute novel understanding, and provide innovation in addressing infrastructure challenges.

3. EAGER is a funding mechanism for supporting exploratory work, in its early stages, on untested but potentially transformative research ideas or approaches. Thus, proposals responsive to this DCL must include a section stating the appropriateness for an EAGER award (for instance, proposals submitted in response to this DCL may be "high-risk, high-reward" by way of involving radically different approaches, applying new expertise, or engaging novel disciplinary or interdisciplinary perspectives). EAGER proposals may request up to \$300,000 in total costs over two years (including indirect costs).

See [PAPPG Chapter II.E.2](#) for specific instructions about preparing EAGER proposals. EAGER proposals may be submitted via FastLane, Research.gov or Grants.gov.

Inquiries about the DCL, general inquiries, and questions about submission of SAI proposals should be directed to [NSF-SAI@nsf.gov](mailto:NSF-SAI@nsf.gov).

Sincerely,

Arthur Lupia, Assistant Director  
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Dawn Tilbury, Assistant Director  
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Karen A. Marrongelle, Assistant Director  
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