

Interdisciplinary Research in Hazards and Disasters (Hazards SEES)

PROGRAM SOLICITATION

NSF 12-610



National Science Foundation

Directorate for Geosciences

Directorate for Computer & Information Science & Engineering
Division of Advanced Cyberinfrastructure

Directorate for Engineering

Directorate for Mathematical & Physical Sciences

Directorate for Social, Behavioral & Economic Sciences

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

February 04, 2013

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Interdisciplinary Research in Hazards and Disasters (Hazards SEES)

Synopsis of Program:

The overarching goal of Hazards SEES is to catalyze well-integrated interdisciplinary research efforts in hazards-related science and engineering in order to improve the understanding of natural hazards and technological hazards linked to natural phenomena, mitigate their effects, and to better prepare for, respond to, and recover from disasters. The goal is to effectively prevent hazards from becoming disasters. Hazards SEES aims to make investments in strongly interdisciplinary research that will reduce the impact of such hazards, enhance the safety of society, and contribute to sustainability. The Hazards SEES program is a multi-directorate program that seeks to: (1) advance understanding of the fundamental processes associated with specific natural hazards and technological hazards linked to natural phenomena, and their interactions; (2) better understand the causes, interdependences, impacts and cumulative effects of these hazards on individuals, the natural and built environment, and society as a whole; and (3) improve capabilities for forecasting or predicting hazards, mitigating their effects, and enhancing the capacity to respond to and recover from resultant disasters.

Hazards SEES seeks research projects that will productively cross the boundaries of the atmospheric and geospace, earth, and ocean sciences; computer and information science; cyberinfrastructure; engineering; mathematics and statistics; and social, economic, and behavioral sciences. Successful proposals will integrate across these multiple disciplines to promote research that advances new paradigms that contribute to creating a society resilient to hazards. Hazards SEES intends to transform hazards and disaster research by fostering the development of interdisciplinary research that allows for appropriately targeted data collection, integration, and management; modeling (including predictive models for real-time decision making); visualization and simulation; data analytics and data-driven discovery; real-time sensing; cross-cutting knowledge development; and synthesis of applicable models and theory. Proposals must demonstrate the inclusion of the appropriate expertise to address the research questions, hypotheses, and problems being posed. Hazards SEES research projects should be designed around one or more locations, identifiable hazards, and/or themes. Furthermore, Hazards SEES research should train the next generation of scientists for interdisciplinary hazards and disaster research.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Gregory J. Anderson, telephone: (703) 292-4693, email: greander@nsf.gov
- Donna Blackman, telephone: (703) 292-7978, email: dblackma@nsf.gov
- Stephen Meacham, telephone: (703) 292-8040, email: smeacham@nsf.gov
- Kishor Mehta, telephone: (703) 292-7081, email: kimehta@nsf.gov
- Leah Nichols, telephone: (703) 292-2983, email: lenichol@nsf.gov
- Anita Nikolich, telephone: (703) 292-4551, email: anikolic@nsf.gov
- Robert E. O'Connor, SBE/SES, telephone: (703) 292-7263, email: roconnor@nsf.gov
- Junping Wang, MPS/DMS, telephone: (703) 292-4488, email: jwang@nsf.gov

- Dennis E. Wenger, ENG/CMMI, telephone: (703) 292-8606, email: dwenger@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.075 --- Social Behavioral and Economic Sciences

Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 10 to 25

Estimated Number of Awards: NSF anticipates funding a combined total of 10 to 25 Type 1 and Type 2 proposals, subject to the availability of funds. Project sizes for Type 1 proposals are expected to range up to \$300,000 for up to 2 years duration. Project sizes for Type 2 proposals are expected to range up to \$3,000,000 for up to 4 years duration.

Anticipated Funding Amount: \$20,000,000 pending availability of funds.

Eligibility Information

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

Because this program is meant to support interdisciplinary research, a minimum of three investigators is required, the Lead Principal Investigator (PI) and two or more co-Investigators (co-PIs) from the lead or participating institutions who are eligible to serve as PI or co-PI on NSF proposals submitted through their respective institutions. In order to ensure an interdisciplinary approach to solving sustainability problems Hazards SEES principal investigators should represent three or more distinct disciplinary areas as described in this solicitation (atmospheric and geospace, earth, and ocean sciences; computer and information science; cyberinfrastructure; engineering; mathematics and statistics; social, economic, and behavioral sciences). Additional PIs or senior personnel may be added to cover other interdisciplinary needs of the project. The appropriateness of the research team's disciplinary composition and expertise will be factors in the merit review of the proposals (see Additional Review Criteria section).

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 1

An individual may appear as Principal Investigator (PI), co-PI, Senior Personnel (or any similar designation), or elsewhere in the proposal budget in no more than one proposal submitted in response to this solicitation. Applicants are responsible for ensuring that no individual is listed as PI, co-PI, Senior Personnel, or elsewhere in the proposal budget on more than one proposal. In cases where an investigator appears in two or more proposals, all proposals submitted with that person may be returned without review.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
 - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
 - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

Every year, natural disasters lead to substantial loss of life and livelihoods, costing an estimated \$50 billion in the form of destroyed public and private property and mobilization of emergency response personnel and equipment in the United States. In 2010, worldwide economic damages from natural disasters alone amounted to \$123.9 billion; 297,000 lives were lost and another 217 million others were affected (Guha-Sapir D, Vos F, Below R, with Ponslerre S. Annual Disaster Statistical Review 2010: The Numbers and Trends. Brussels: Centre for Research on the Epidemiology of Disasters; 2011). To enhance disaster resilience, fundamental challenges in disaster and hazards research must be addressed. The overarching goal of Hazards SEES is to catalyze well-integrated interdisciplinary research efforts in hazards-related science and engineering in order to improve the understanding of natural hazards and technological hazards linked to natural phenomena, mitigate their effects, and to better prepare for, respond to, and recover from disasters. The goal is to effectively prevent hazards from becoming disasters.

Hazards SEES aims to make investments in strongly interdisciplinary research that will reduce the impact of such hazards, enhance the safety of society, and contribute to sustainability. A sustainable world is one in which human needs are met equitably and without sacrificing the ability of future generations to meet their needs. Meeting this formidable challenge requires a substantial increase in our understanding of the integrated system of society, the natural world, and the alterations humans bring to Earth. NSF's Science, Engineering, and Education for Sustainability (SEES) activities aim to address this need through support for interdisciplinary research and education.

A sustainable world is also one in which the degree to which a system's (such as a social or economic system, or a built environment) susceptibility to damaging effects of a hazardous event - i.e., its vulnerability - is reduced. And it is one in which a system, community or society exposed to hazards is able to resist, absorb, accommodate, and recover from the effects of a hazardous event; in other words to be resilient. Vulnerability and resilience depend upon the understanding of the degree to which the society and infrastructure are exposed to hazardous events and their potential consequences.

Fundamental to all sustainability research is the simultaneous consideration of social, economic, and environmental systems and the long-term viability of those systems. Concepts that underlie the science of sustainability include complex adaptive systems theory, emergent behavior, multi-scale processes, as well as the vulnerability, adaptive capacity, and resilience of coupled human-environment systems. An important research goal is to understand how patterns and processes at the local and regional scales are shaped by - and feed into - processes and patterns that manifest at the global scale over the long term. These topics guide research to explore alternate ways of managing the environment, migrating from finite resources to renewable or inexhaustible resources, and

applying technology to improve human well-being. Conceptual frameworks for sustainability, including general theories and models, are critically needed for such informed decision-making.

SEES activities span the entire range of scientific domains at NSF and aim to: 1) support interdisciplinary research and education that can facilitate the move towards global sustainability; 2) build linkages among existing projects and partners and add new participants in the sustainability research enterprise; and 3) develop a workforce trained in the interdisciplinary scholarship needed to understand and address the complex issues of sustainability.

II. PROGRAM DESCRIPTION

The Hazards SEES program is a multi-directorate (CISE, ENG, GEO, MPS, OCI, SBE) program that seeks to

- advance understanding of the fundamental processes associated with specific natural hazards and technological hazards linked to natural phenomena, and their interactions;
- better understand the causes, interdependencies, impacts and cumulative effects of these hazards on individuals, the natural and built environment, and society as a whole; and
- improve capabilities for forecasting or predicting hazards, mitigating their effects, and enhancing the capacity to respond to and recover from resultant disasters.

Hazards SEES seeks research projects that will productively cross the boundaries of the atmospheric and geospace, earth, and ocean sciences; computer and information science; cyberinfrastructure; engineering; mathematics and statistics; and social, economic, and behavioral sciences. Successful proposals will integrate across these multiple disciplines to promote research that advances new paradigms that contribute to creating a society resilient to hazards. Hazards SEES intends to transform hazards and disaster research by fostering the development of interdisciplinary research that allows for appropriately targeted data collection, integration, and management; modeling (including predictive models for real-time decision making); visualization and simulation; data analytics and data-driven discovery; real-time sensing; cross-cutting knowledge development; and synthesis of applicable models and theory. Proposals must demonstrate the inclusion of the appropriate expertise to address the research questions, hypotheses, and problems being posed. Hazards SEES research projects should be designed around one or more locations, identifiable hazards, and/or themes. Furthermore, Hazards SEES research should train the next generation of scientists for interdisciplinary hazards and disaster research.

Key Attributes of Hazards SEES Research

1. Integration across Disciplines: Proposals submitted to the Hazards SEES program must demonstrate meaningful integration across disciplines to solve outstanding problems that would address the principal objectives outlined above and that go beyond existing approaches that can be addressed within the individual disciplines and usual core-program co-funded research opportunities at NSF. Although many disciplinary challenges remain in hazards and disaster research, it is the intent of this program to bridge significant existing gaps between disciplinary foci and to foster new lines of research that emerge only in an interdisciplinary context. Proposals are expected to document that the proposed research is truly interdisciplinary and that the respective components are fully integrated and necessary for the successful execution of the proposed project. Plans for integration of the respective research components must be fully outlined in the proposal. In order to ensure an interdisciplinary approach to solving sustainability problems Hazards SEES principal investigators should represent three or more distinct disciplinary areas as described in this solicitation (atmospheric and geospace, earth, and ocean sciences; computer and information science; cyberinfrastructure; engineering; mathematics and statistics; and social, economic, and behavioral sciences). The appropriateness of the research team's disciplinary composition and expertise will be factors in the merit review of the proposals (see Additional Review Criteria section).

2. Broadly Applicable/Transferable: Even if conducted more locally or regionally, Hazards SEES research should be readily transferrable and can clearly support applications to equivalent hazards in a global context. An integral component of all proposals should be the communication of outcomes, availability of research artifacts, and connection to related national and international activities where applicable, including involvement of relevant stakeholders, where appropriate.

3. Partnerships: Hazards and disasters research has natural linkages with federal agencies, various stakeholders (practitioners, policy, communities, etc.), and international partners. In order to enhance the broader applicability and transferability of this research, linkages within and between universities; research centers; state, local, and tribal governments; community organizations; federal agencies and national labs; and private organizations are encouraged. Engaging partners and stakeholders in the early phases of problem identification and definition, and iterative subsequent engagement can lead to novel paths of scientific inquiry and facilitate application of new scientific insights. Proponents are also encouraged to look for synergies with existing activities, facilities, networks, and centers. Hazards SEES proposals should build on these partnerships and provide a full description of the contribution and relevance of such partnerships in the Project Description and in letters of collaboration.

4. Education and Workforce Development: Hazards SEES proposals should include plans for the education, training, and development of the next generation of researchers in hazards and disaster research as well as explore mechanisms to transfer knowledge to practitioners in disaster mitigation and response. Components of education and workforce development might include: 1) involvement of undergraduate students in hazards and disaster research through the inclusion of an REU supplement to the Hazards SEES proposal as described in [NSF 12-569](#); 2) technology transfer and community education to stakeholders, partners, and practitioners; 3) training of graduate students and post-doctoral fellows; 4) workshops focused on training researchers in fields of hazards and disaster research that are outside of their discipline (e.g., workshops on engineering research on tornadoes for geoscientists, social scientists, etc.).

Hazards SEES will support two types of awards that embody the attributes above:

Type 1: These proposals forge new or emerging interdisciplinary teams to develop ideas and approaches through either: (a) exploratory research that could, for example, mine, integrate, and synthesize existing data sets, collect limited new data, conduct modeling experiments, test new integrative approaches, and/or identify new conceptual ideas and key gaps in knowledge and methods; or (b) networking activities that would foster communication/coordination and promote new collaborations among scientists and engineers with diverse expertise across disciplinary, organizational, institutional, geographical and/or international boundaries. The inclusion of early career researchers and, where appropriate, postdoctoral researchers, graduate students, and undergraduate students in Type 1 projects is encouraged. Type 1 proposals are expected to range up to \$300,000 for up to 2 years duration.

Type 2: These proposals support interdisciplinary research to conduct major new integrated hazards research. These may include theoretical, field, laboratory and/or modeling activities. Type 2 proposals are expected to range up to \$3,000,000 for up to 4 years duration.

III. AWARD INFORMATION

Estimated Number of Awards: NSF anticipates funding a combined total of 10 to 25 Type 1 and Type 2 proposals, subject to the availability of funds. Project sizes for Type 1 proposals are expected to range up to \$300,000 for up to 2 years duration. Project sizes for Type 2 proposals are expected to range up to \$3,000,000 for up to 4 years duration.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

Because this program is meant to support interdisciplinary research, a minimum of three investigators is required, the Lead Principal Investigator (PI) and two or more co-Investigators (co-PIs) from the lead or participating institutions who are eligible to serve as PI or co-PI on NSF proposals submitted through their respective institutions. In order to ensure an interdisciplinary approach to solving sustainability problems Hazards SEES principal investigators should represent three or more distinct disciplinary areas as described in this solicitation (atmospheric and geospace, earth, and ocean sciences; computer and information science; cyberinfrastructure; engineering; mathematics and statistics; social, economic, and behavioral sciences). Additional PIs or senior personnel may be added to cover other interdisciplinary needs of the project. The appropriateness of the research team's disciplinary composition and expertise will be factors in the merit review of the proposals (see Additional Review Criteria section).

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 1

An individual may appear as Principal Investigator (PI), co-PI, Senior Personnel (or any similar designation), or elsewhere in the proposal budget in no more than one proposal submitted in response to this solicitation. Applicants are responsible for ensuring that no individual is listed as PI, co-PI, Senior Personnel, or elsewhere in the proposal budget on more than one proposal. In cases where an investigator appears in two or more proposals, all proposals submitted with that person may be returned without review.

Additional Eligibility Info:

PIs from non-NSF-sponsored FFRDC's are not permitted to submit proposals to Hazards SEES.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

Except as modified below, proposals should be prepared in accordance with the guidelines in the Grant Proposal Guide or NSF Grants.gov Application Guide.

Hazards SEES Collaborative Proposals:

All Hazards SEES proposals that involve multiple institutions must be submitted as a single proposal with subawards. Guidance on the preparation and submission of a collaborative proposal from one organization is found in Chapter II, Section D.4 of the NSF Grant Proposal Guide.

Cover page:

The title of the proposed project should begin with the string "Hazards SEES Type 1:" or "Hazards SEES Type 2:" Make sure to identify this Solicitation Number on the Proposal Cover Sheet.

Supplementary Documents:

Management and Integration Plan: A Management and Integration Plan up to 3 pages in length is required for Type 1 and Type 2 proposals. The Management and Integration Plan should: a) list all Senior Personnel in the project (provide the last name, first name, and institution/organization); b) describe how the group effort will be coordinated; c) describe how the disciplinary components will be integrated; d) describe collaborations and partnerships and their integration with the project; e) describe how data, models, and ideas will be disseminated and shared with the research community and stakeholders. A clear time line of expected outcomes should be included, as well as plans for the integration of research and education.

Use of NSF Research Platforms and Facilities: Projects that will be utilizing NSF research platforms (e.g., ships, research aircraft, etc.) or other shared use facilities (e.g., field instrumentation, analytical or experimental facilities) are responsible for filing a copy of their Request for Facility Support as a supplementary document in their proposal. PIs should coordinate their requests with the appropriate facility to ensure that access is available and fits within the time line of the proposed research.

Computational Facilities: For projects that will be utilizing NSF computational facilities, a copy of the allocation request that would be submitted to the facility in question should be provided as a supplementary document.

Data Management Plan: Proposals must include a data and information management plan that describes how access to quality-controlled and fully-documented data and information by researchers, and others, will be achieved at no more than incremental cost and within a reasonable time during the course of the award, e.g., via a recognized data repository. The plan should address, as appropriate, provisions for reuse and derivative use, archival plans, and preservation of access for both research and non-research communities. If applicable, policies and provisions for appropriate protection of privacy, confidentiality, security, intellectual property, or other rights or requirements should be included.

Single Copy Documents:

Project Personnel (text-searchable PDF, in FastLane, under Additional Single Copy Documents). A list of all project personnel is required. For each person, provide the last name, first name, and institution/organization. A corresponding biographical sketch should be provided for all individuals included on this list, as instructed in Section II.C.2.f of the Grant Proposal Guide.

Collaborators/Individuals with Conflicts of Interest (text-searchable PDF, in FastLane, under Additional Single Copy Documents). A list, in an alphabetized table, of the full names and institutional affiliations of all persons with potential conflicts of interest as specified in NSF's Grant Proposal Guide is required. For each PI, Co-PI, collaborator and other Senior Personnel, include all co-authors/editors and collaborators (within the past 48 months), all graduate advisors and advisees, and any other individuals or institutions with which the investigator has financial ties (please specify type). In addition, list all subawardees who would receive funds through the Hazards SEES award.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Budgets should include costs of travel for up to four members of the research team (including the PI and a least one other senior investigator) to the Washington, D.C. area to participate in grantees meetings in year 1 for Type 1 and 2 proposals and in year 3 for Type 2 proposals. The purpose of these meeting is to provide an opportunity for participants to share research approaches and results, promote interaction of Type 1 and Type 2 awardees, and to encourage discussion of the new types of interdisciplinary collaborations necessary for Hazards SEES research.

This program will support the costs of U.S.-based scientists and their students. International collaborators are encouraged to seek support from their respective funding organizations. Funding guidelines for involving international collaborators allow the following expenses to be included in the NSF budget: 1) Travel expenses for U.S. scientists and students participating in exchange visits integral to the project; 2) Limited project-related expenses for international partners to engage in research activities while in the United States as project participants; 3) Project-related expenses for U.S. participants to engage in research activities while abroad.

Budgets for Research Platforms and Facilities: For projects utilizing NSF research platforms (e.g., ships, research aircraft, etc.) or other shared use facilities (e.g., field instrumentation, analytical or experimental facilities) PIs must prepare their budgets consistent with the customary practices of the facility. Costs that are not borne by the facility must be included in the budget cap of \$300K for Type 1 proposals and \$3M for Type 2 proposals. Non-NSF facilities costs should be included in the proposal budget and count toward the applicable budget cap.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

February 04, 2013

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at:

<https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage:

<http://www.grants.gov/web/grants/applicants.html>. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as [Exhibit III-1](#).

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in [Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018](#). These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously

- established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. ([GPG Chapter II.C.2.d.i.](#) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including [GPG Chapter II.C.2.d.i.](#), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

In addition to the National Science Board merit review criteria, reviewers will be asked to apply several specific criteria when reviewing Hazards SEES proposals. These criteria include:

1. How well do the proposed research and educational activities integrate across NSF-supported disciplines, such as creating new interdisciplinary networks and/or collaborations?
2. How well do the proposed activities advance the foundations of sustainability by including a strong conceptual framework that addresses the social, economic, and environmental components?
3. How will the proposed activities advance the development of a workforce skilled in the interdisciplinary scholarship needed to understand and address the complex issues of sustainability?
4. Quality and appropriateness of the Management and Integration Plan. This includes: a) a well defined management plan with a highly qualified project director, b) the extent to which the group effort integrates across disciplines and is focused on a cohesive, well-delineated goal or set of goals, c) the strength and appropriateness of proposed collaborations and partnerships, including, if appropriate, international collaborations; d) the quality of the plans for dissemination and sharing of data, models, tools and ideas, including dissemination to the research community and stakeholders; e) quality and expected significance of education and workforce development plan; f) the adequacy and appropriateness of the proposed time line.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will be completed and submitted by each reviewer. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell

applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process).

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the *NSF Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). Within 90 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the *NSF Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Gregory J. Anderson, telephone: (703) 292-4693, email: greander@nsf.gov
- Donna Blackman, telephone: (703) 292-7978, email: dblackma@nsf.gov
- Stephen Meacham, telephone: (703) 292-8040, email: smeacham@nsf.gov
- Kishor Mehta, telephone: (703) 292-7081, email: kimehta@nsf.gov
- Leah Nichols, telephone: (703) 292-2983, email: lenichol@nsf.gov
- Anita Nikolich, telephone: (703) 292-4551, email: anikolic@nsf.gov
- Robert E. O'Connor, SBE/SES, telephone: (703) 292-7263, email: roconnor@nsf.gov
- Junping Wang, MPS/DMS, telephone: (703) 292-4488, email: jwang@nsf.gov
- Dennis E. Wenger, ENG/CMMI, telephone: (703) 292-8606, email: dwenger@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

Note to Potential PIs: We anticipate that the next solicitation for Hazards SEES will not be issued until at least summer 2014.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF [Grants Conferences](#). Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF's website at https://public.govdelivery.com/accounts/USNSF/subscriber/new?topic_id=USNSF_179.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at <http://www.grants.gov>.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (703) 292-5111

(NSF Information Center):

• **TDD (for the hearing-impaired):** (703) 292-5090

• **To Order Publications or Forms:**

Send an e-mail to: nsfpubs@nsf.gov

or telephone: (703) 292-7827

• **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, [NSF-50](#), "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and [NSF-51](#), "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Office of the General Counsel
National Science Foundation
Arlington, VA 22230

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