Interdisciplinary Research in Hazards and Disasters (Hazards SEES)

PROGRAM SOLICITATION
NSF 14-581

REPLACES DOCUMENT(S):
NSF 12-610

National Science Foundation

Directorate for Geosciences

Directorate for Computer & Information Science & Engineering

Directorate for Engineering

Directorate for Mathematical & Physical Sciences

Directorate for Social, Behavioral & Economic Sciences

Office of Integrative Activities

Letter of Intent Due Date(s) *(required)* (due by 5 p.m. proposer's local time)*:*

September 26, 2014

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

December 03, 2014

IMPORTANT INFORMATION AND REVISION NOTES

Proposers must now submit a required Letter of Intent in order to submit a full proposal. The program is no longer soliciting exploratory, team building proposals (previously Type 1 grants). The program-specific review criteria have been updated. The program requires additional supplementary documentation.

This solicitation is the second for the Hazard SEES program, and the competition associated with this solicitation is intended to be the last for Hazards SEES. NSF anticipates future funding opportunities may be available in the broad areas of hazards, risk, and resilience included in Hazards SEES.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 15-1), which is effective for proposals submitted, or due, on or after December 26, 2014. The PAPPG is consistent with, and, implements the new Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance) (2 CFR § 200).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Interdisciplinary Research in Hazards and Disasters (Hazards SEES)

Synopsis of Program:

Hazards SEES is a program involving multiple NSF Directorates and Offices (CISE, ENG, GEO, MPS, OIIA, and SBE) 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, interdependencies, 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. The overarching goal of Hazards SEES is to catalyze well-integrated interdisciplinary research efforts in hazards-related science and engineering in order to reduce the impact of hazards, enhance the safety of society, and contribute to sustainability.

Hazards SEES seeks research projects that will productively cross the boundaries of the atmospheric and geospace, earth, and ocean sciences; computer and information science (including cyberinfrastructure); engineering; mathematics and statistics; and social, economic, and behavioral sciences. Successful proposals will integrate across 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.

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, GEO/EAR, telephone: (703) 292-4693, email: greander@nsf.gov

- Leah Nichols, SBE/BCS, telephone: (703) 292-2983, email: lenichol@nsf.gov

- Amanda (Manda) S. Adams, telephone: (703) 292-8521, email: amadams@nsf.gov

- Stephen Meacham, OD/IIA, telephone: (703) 292-8040, email: smeacham@nsf.gov

- Kishor Mehta, ENG/CMMI, telephone: (703) 292-7081, email: kimehta@nsf.gov

- Anita Nikolich, CISE/ACI, 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
- 47.083 --- Office of Integrative Activities (OIA)

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 10 to 20

NSF anticipates funding a total of 10 to 20 proposals, subject to the availability of funds. NSF expects to fund a mix of project sizes up to a maximum of $3,000,000 for up to four years. The program also encourages projects at a lower budget level or 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, the proposal team must include at least three investigators: the 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. Additional PIs or senior personnel may be added as needed. 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. Proposers 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 will be returned without review.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Submission of Letters of Intent is required. Please see the full text of this solicitation for further

information.

- **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

- **Letter of Intent Due Date(s)** *(required)* (due by 5 p.m. proposer's local time)*:*

    September 26, 2014

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

    December 03, 2014

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 Ponserre 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 a system's (e.g., a social or economic system or a built environment) *vulnerability* to damaging effects of a hazardous event is reduced. It is also one in which a system 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.

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

Hazards SEES is a program involving multiple NSF Directorates and Offices (CISE, ENG, GEO, MPS, OIIA, SBE) 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 (including cyberinfrastructure); engineering; mathematics and statistics; and social, economic, and behavioral sciences. Successful proposals will integrate across 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.

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, NSF intends this program to bridge significant existing gaps between disciplinary foci and to foster new lines of research that emerge only in an interdisciplinary context.

   In order to ensure a sufficiently broad interdisciplinary approach to solving sustainability problems, Hazards SEES proposals must incorporate science from three or more intellectually distinct disciplines that, in aggregate, represent scientific areas supported by three or more of the participating NSF directorates.

   Proposals must document that the proposed research is truly interdisciplinary, that the respective components are fully integrated and necessary for the successful execution of the proposed project, and that the research team contains sufficient expertise to carry out all dimensions of the research plan. Plans for integration of the respective research components must be fully outlined in the proposal.

2. **Broadly Applicable/Transferable:** Even if conducted more locally or regionally, Hazards SEES research should be readily transferrable and 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, the program encourages linkages within and between universities; research centers; state, local, and tribal governments; community organizations; Federal agencies and national labs; and private organizations. 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. NSF also encourages proponents 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.

III. AWARD INFORMATION

NSF anticipates funding a total of 10 to 20 proposals, subject to the availability of funds. NSF expects to fund a mix of project sizes up to a maximum of $3,000,000 for up to four years. The program also encourages projects at a lower budget level or 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, the proposal team must include at least three investigators: the 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. Additional PIs or senior personnel may be added as needed. 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. Proposers 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 will be returned without review.

Additional Eligibility Info:

> Non-NSF-sponsored FFRDC's are not permitted to submit proposals to Hazards SEES. Investigators from non-NSF-sponsored FFRDC's may participate in a Hazards SEES proposal, provided no NSF funds are used to support their participation.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Letters of Intent *(required):*

- Potential proposers may not submit a proposal to this solicitation without first submitting a corresponding FastLane Letter of Intent (LOI) by the LOI deadline. Submitting a Letter of Intent does not obligate potential proposers to submit a full proposal.
- NSF will use the LOIs submitted to (1) gauge the size and range of the proposals that may be submitted in response to this solicitation; (2) enable earlier identification and better management of potential panelists; and (3) assist with identifying potential conflicts of interest that may affect review of Hazards SEES proposals. In addition, NSF requires LOIs for this competition in order to encourage early development of prospective PI teams.
- Hazards SEES Letters of Intent
  - LOIs must include, in the "Synopsis" text data field, a synopsis that describes the work in sufficient detail to permit an appropriate selection of potential reviewers.
  - LOIs must include, in the "Other Comments" text data field, full names and institutional affiliations for all project Senior Personnel (including subawardees) and a description of how the PI team intends to ensure meaningful interdisciplinary integration during the proposed project.

Letter of Intent Preparation Instructions:

When submitting a Letter of Intent through FastLane in response to this Program Solicitation please note the conditions outlined below:

- Sponsored Projects Office (SPO) Submission is not required when submitting Letters of Intent
- Disciplines Represented by Senior Personnel (list name and discipline(s)) is required when submitting Letters of Intent
- Estimated Total Funding Request is required when submitting Letters of Intent
- Submission of multiple Letters of Intent is not allowed

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.

Revisions of Previously Submitted Proposals:

Proposals submitted to this competition that have previously been declined in any NSF competition must be substantially revised to meet Hazards SEES criteria, and must contain a separate section of the Project Description explicitly describing what changes have been made to the proposal. Any such proposal that has not been substantially revised may be returned without review, per the Grant Proposal 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:". Make sure to identify the solicitation number for this solicitation on the Proposal Cover Sheet.

Supplementary Documents:

Management and Integration Plan (MIP):

A Management and Integration Plan up to 4 pages in length is required. The MIP should:

1. list all Senior Personnel (including subawardees) in the project (provide the last name, first name, and institution/organization), identify each person's relevant disciplinary expertise, and describe each person's specific role(s) in the proposed project;
2. describe how the group effort will be coordinated;
3. describe how the three or more intellectually distinct disciplinary components will be integrated;
4. describe collaborations and partnerships and their integration with the project;
5. describe how data, models, and ideas will be disseminated and shared with the research community and stakeholders; and
6. include a clear time line of expected outcomes.

Proposals lacking a Management and Integration Plan will be returned without review.

Use of NSF Research Platforms and Facilities: PIs for projects that will utilize NSF research platforms (e.g., ships, research aircraft, etc.) or other shared-use facilities (e.g., field instrumentation, analytical or experimental facilities) must file a formal request for support with the organization managing the platform(s) and/or facility/facilities to be used, prior to submitting the proposal. The PI must include documentation of the managing organization's response to the PI request (e.g., a Letter of Support Commitment, Request for Facility Support, etc.) as Supplementary Documentation in the submitted proposal.

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. Proposals lacking a Data Management Plan will be returned without review.

Single Copy Documents:

Project Personnel (text-searchable PDF, in FastLane or Grants.gov, under Additional Single Copy Documents). A list of all project personnel is required. For each person known at the time of proposal submission, provide the last name, first name, and institution/organization; undergraduate students, graduate students, and postdoctoral researchers not yet specifically identified do not need to be included in this list. 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. Proposals lacking the list of project personnel and/or corresponding biographical sketch(es) may be returned without review.

Collaborators/Individuals with Conflicts of Interest (text-searchable PDF, in FastLane or Grants.gov, under Additional Single Copy Documents). Proposers are required to submit an alphabetized list of the full names and institutional affiliations of all persons with potential conflicts of interest with any PI, co-PI, collaborator, subawardee, or other Senior Personnel. Persons with potential conflicts of interest include each individual's thesis advisor(s) and advisees, collaborators within the past 48 months, any close family members who are researchers in the fields covered by the proposal, or any other person who, if asked to review the proposal, might

have a potentially disqualifying conflict of interest as described in the Grant Proposal Guide, NSF 14-01, Exhibit II-2 (http://www.nsf.gov/pubs/policydocs/pappguide/nsf14001/gpg_2.jsp#IIex2). Proposals lacking the required list of potential conflicts of interest may be returned without review.

Additional Required Documents

List of Participating Individuals

After submission of the final proposal, and after receipt of the final seven-digit proposal ID from FastLane, send an email to hazardssees@nsf.gov with the subject

[Hazards SEES] [COI] XXXXXXX

(including the brackets), where XXXXXXX is the proposal number from FastLane. The body of the email should be empty. Attach the document described below, prepared on a template available at http://www.nsf.gov/geo/fesd/.

The document is a spreadsheet containing two lists: one (columns C-E) lists the last names, first names, and institutional affiliations of all PIs, Co-PIs, and other senior personnel involved, including involvement via subawards; the second (columns F-H) lists the full names and institutional affiliations of each individual's thesis advisor(s) and advisees, collaborators within the past 48 months, any close family members who are researchers in the fields covered by the proposal, or any other individual who, if asked to review the proposal, might have a potentially disqualifying conflict of interest as described in the Grant Proposal Guide, NSF 14-01, Exhibit II-2 (http://www.nsf.gov/pubs/policydocs/pappguide/nsf14001/gpg_2.jsp#IIex2). The seven-digit proposal ID should appear in every row of the file, in column B, as indicated by the sample available at http://www.nsf.gov/geo/fesd/. Each project participant in columns C-E should be listed (repeatedly) in all rows that name individuals in columns F-H that are connected with that project participant. The purpose of this document is to help NSF staff screen potential reviewers for possible conflicts of interest.

The file name should be the final FastLane seven-digit proposal ID, followed by the three characters "coi", followed by the extension "csv". For example, for a proposal with ID 1512345, the file must be named 1512345coi.csv.

NSF personnel will use automated data handling of this document, which requires plain text in CSV format. The submitted file **must not** include additional formatting; in particular, carriage returns, splitting items over multiple cells, extra spaces, etc., will interfere with automated handling.

Please note that this document is redundant with the Additional Single Copy Documents listed above. At present, it is not technically feasible for one document to perform both functions.

B. Budgetary Information

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

Other Budgetary Limitations:

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 $3,000,000. Non-NSF facilities costs should be included in the proposal budget and count toward the applicable budget cap.

C. Due Dates

- **Letter of Intent Due Date(s)** *(required)* (due by 5 p.m. proposer's local time)*:*

  September 26, 2014

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

  December 03, 2014

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 the following program-specific criteria when reviewing Hazards SEES proposals.

- **Interdisciplinary integration**
    - How well do the proposed research activities integrate across at least three or more intellectually distinct disciplines that, in aggregate, represent scientific areas supported by three or more of the participating NSF directorates?
    - Does the research team include sufficient expertise to carry out the interdisciplinary research?
- **Partnerships and Applicability**
    - Will the proposed research be broadly applicable and transferable?
    - How well will the proposed collaborations and partnerships advance the research and support dissemination of the results?
- **Advancing Sustainability:** How well do the proposed activities advance the foundations of sustainability
- **Quality and Appropriateness of the Management and Integration Plan (MIP)**
    - How strong is the MIP?
    - How qualified is the project PI to carry out the MIP?
    - Is the research team focused on an interdisciplinary, cohesive, and well-delineated goal or set of goals?
    - What is the quality of the proposed plan for the dissemination of data, models, tools, and ideas (1) to the research community and (2) to stakeholders?
    - Is the proposed timeline adequate and appropriate?

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or 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.

The program may implement a two-stage panel review process, depending on the number and breadth of proposals received. During a first review stage, groups of thematically similar proposals would undergo panel review. The program's management team would consider the panels' advice and, if warranted, select proposals to move on to a second stage of review. Proposals not selected for further consideration may be declined at this point. PIs for proposals selected for further consideration may be invited to provide a written response (maximum of 2 pages) to the stage-one reviews. A second review panel may take into consideration the stage-one reviews and panel summary and the PIs' written response when reviewing a given proposal.

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, GEO/EAR, telephone: (703) 292-4693, email: greander@nsf.gov

- Leah Nichols, SBE/BCS, telephone: (703) 292-2983, email: lenichol@nsf.gov

- Amanda (Manda) S. Adams, telephone: (703) 292-8521, email: amadams@nsf.gov

- Stephen Meacham, OD/IIA, telephone: (703) 292-8040, email: smeacham@nsf.gov

- Kishor Mehta, ENG/CMMI, telephone: (703) 292-7081, email: kimehta@nsf.gov

- Anita Nikolich, CISE/ACI, 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.

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 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:

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Reports Clearance Officer
Office of the General Counsel
National Science Foundation
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