Global Centers (GC)

Use-Inspired Research Addressing Global Challenges in Climate Change and Clean Energy

PROGRAM SOLICITATION

NSF 23-557

National Science Foundation

Office of International Science and Engineering

Directorate for Biological Sciences

Directorate for Computer and Information Science and Engineering

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical and Physical Sciences

Directorate for Social, Behavioral and Economic Sciences

Directorate for STEM Education

Directorate for Technology, Innovation and Partnerships

Office of Integrative Activities

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Natural Sciences and Engineering Research Council (NSERC) and Social Science and Humanities Research Council (SSHRC)

UK Research and Innovation (UKRI)

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

May 10, 2023

Track 1 GC Implementation

Submission Window Date(s) (due by 5 p.m. submitter's local time):

April 12, 2023 - May 10, 2023

Track 2 GC Design

IMPORTANT INFORMATION AND REVISION NOTES

The Global Centers program is an NSF-led effort, implemented in partnership with like-minded international funders, to encourage and support large-scale collaborative research on use-inspired themes in climate change and clean energy. Here, the "used-inspired" nature of the research refers to project outcomes leading to foreseeable benefits to society. These outcomes should help the assessment and/or mitigation of climate-change impacts on society, people, and communities, and/or the development of clean-energy solutions. NSF partner countries in this inaugural Global Centers competition are Australia, Canada, and the United Kingdom. International funding organizations, hereafter called funding partner agencies, are as follows:

- Australia: Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Canada: Natural Sciences and Engineering Research Council (NSERC) and Social Science and Humanities Research Council (SSHRC)
- United Kingdom: UK Research and Innovation (UKRI)

NOTE: in this document, unless marked otherwise, reference to principal investigators (PIs) refers by default to U.S. PIs working in U.S. organizations, i.e., PIs of NSF proposals; see NSF Proposal & Award Policies & Procedures Guide (PAPPG), Chapter II Exhibit II-3 A.1, for NSF definition of a principal investigator. Notably, the proposal preparation instructions and eligibility criteria sections mostly apply to U.S. PIs and organizations. Please see section II.D.1 for additional

specific requirements from funding partner agencies for non-U.S.-based scientists, when applicable. Also, Science, Technology, Engineering, and Mathematics (STEM) here refers to all disciplinary fields relevant to NSF; these notably include Social Sciences which are particularly relevant in the framework of the Global Centers call.

FY2023 Global-Center program has two tracks. Track 1 is a pilot program aiming to implement the first Global Centers, for which NSF intends to expand the number and type of partners in future competitions. Foreign teams on successful Track-1 proposals will be funded by their respective country agencies; depending on the partner countries and agencies, investigators may be required to develop research plans around specific themes as detailed in the Program Description. Track 2 supports coordination research and education efforts aiming to develop future Global Centers. Proposals should target and be submitted to one of the following Tracks (see details in the Project Description section):

Track 1: Global Center Implementation: Research Partnerships with Australia, Canada, and the United Kingdom

Track 2: Community-driven Global-Center Design

NSF will coordinate and manage the review of proposals in consultation with the participating international funding organizations, according to the respective arrangements with NSF (see Section II.D.1 below). Relevant information about proposals and reviews of proposals will be shared with the participating organizations as appropriate, according to the respective arrangements with NSF.

IMPORTANT INFORMATION

In the framework of the Global Centers call, proposers who include off-campus or off-site research as part of their project must submit, as supplementary documentation, a Plan for Safe and Inclusive Work Environments. For this solicitation, this document replaces the required plan associated with the certification in Chapter II.E.9 of the Proposal and Award Policies and Procedures Guide (PAPPG, NSF 23-1). Instructions for inclusion of the Plan for Safe and Inclusive Working Environments can be found in the additional proposal preparation instructions in this solicitation.

Any proposal submitted in response to this solicitation should be submitted in accordance with the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) that is in effect for the relevant due date to which the proposal is being submitted. The NSF PAPPG is regularly revised and it is the responsibility of the proposer to ensure that the proposal meets the requirements specified in this solicitation and the applicable version of the PAPPG. Submitting a proposal prior to a specified deadline does not negate this requirement.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Global Centers (GC)
Use-Inspired Research Addressing Global Challenges in Climate Change and Clean Energy

Synopsis of Program:

This solicitation launches an ambitious new program to fund international, interdisciplinary collaborative research centers that will apply best practices of broadening participation and community engagement to develop use-inspired research on climate change and clean energy. This program will prioritize research collaborations fostering team science, community-engaged research, and use knowledge-to-action frameworks. The proposed research work should maximize the benefits of international, interdisciplinary collaborations.

Climate change is a global threat that impacts the natural and human world through changes in regional weather patterns, acceleration of species extinctions, alteration of the structure and function of ecosystems as well as by affecting human societies, the built environment, and processes in urban and rural areas around the globe. Given the complexity of the problem and the cascading nature of impacts, climate change demands convergent, interdisciplinary research collaborations that bring together studies of any number of topics such as greenhouse gas emissions, atmospheric and oceanic circulation drivers, impacts of natural and built environment, human behavior, and policy constraints, coupled with innovative artificial intelligence (AI), computational and data science solutions, to help assess or mitigate community impacts and/or lead to technology developments.

The changes to the global climate system are diverse, with some areas experiencing greater flooding frequencies or intensities, others impacted by more frequent or more severe heat or droughts, and still others suffering from sea level rise. Impacts on natural systems vary greatly from changes in the distribution of plants and animals, alterations in the flow of energy and materials within ecosystems, changes in the timing of biological processes, altered molecular and cellular processes, to increased occurrences of infectious diseases. Changes to human systems show complex responses, including those in transportation and agricultural production, cultural innovation, economic policies, as well as in diverse effects on manufacturing, electrical production and distribution, and computation.

Conceiving solutions to climate change may involve decarbonization efforts such as switching to renewable or clean energy or deploy technologies that directly remove CO_2 from the atmosphere such as Net Zero initiatives. Developing solutions will require interdisciplinary collaboration and international cooperation to accelerate the transition to clean energy or net zero through science, technology, and policy. In some regions solutions might employ urban planning to address environmental justice issues or reduce exposure to high heat or flooded areas, other solutions might use nature-inspired design to develop resilient environments. Still others might focus on engineering solutions to failing power grids, employ novel statistical and mathematical methods to pro-actively evaluate the associated climate-induced risks, use AI, biotechnology or advanced manufacturing to innovate solutions, while others might create economic policies to incentivize social change. This list is not exhaustive.

Climate change is complex and solutions requires synergistic partnerships. It crosses geo-political borders, and mitigation and adaptation require a mix of scientific, technological, and policy knowledge, and an inclusive approach that involves stakeholder groups to develop the informed approaches, responses, and actions. Global cooperation among researchers is needed to bring a range of skills, experiences, and

knowledge to understanding the problem, devising solutions, and training the world's scientific workforce. The diverse needs, priorities, experiences, and perspectives of impacted communities will be essential components to drive innovative research to mitigate impacts of climate change on human and natural systems, promote adaptation to climate change, and explore clean energy alternatives.

NSF is committed to building a diverse and inclusive workforce to increase the Nation's capacity to perform STEM research and development, enhance innovation, and create new technologies that benefit society. Many of the communities that are most vulnerable to the effects of climate change include significant populations of groups that have historically not been included in STEM fields or in the development of STEM research. Important aims of this program are to broaden participation in research and engage stakeholders in innovative and meaningful ways that benefit individuals, communities, society, and STEM disciplines through diversity, equity, inclusion, and access (DEIA). Successful proposals will embrace both broadening participation and stakeholder engagement as key values that are integrated into the design of the Centers and the choice of science priorities to explore. Broadening participation, in this context, includes rethinking how one identifies, approaches, and prioritizes scientific questions to involve a diversity of individuals in the scientific enterprise. Diversifying the research workforce through a variety of approaches that support sustainable inclusion in the workplace is an important component of broadening participation. Stakeholder engagement through citizen science, partnerships, community engagement and many more types of activities that help drive research priorities will also support and facilitate broadening participation in STEM.

The main objectives of a Center must focus on any combination of research disciplines supported by NSF. However, if some of the stakeholders' expertise fall out of that scope, justification must be provided as to how their expertise is required to advance the main research focus of the Centers.

Centers are expected to be driven by a bold vision for high-impact, use-inspired, basic research along with a strategy to integrate diverse perspectives from different stakeholder groups into the research endeavor, including perspectives from beyond the academic sector. It is expected that this effort will enhance societal benefits and expand international partnerships while building a diverse scientific and stakeholder community able to potentially carry out the work beyond the Center funding period.

Centers are expected to create and promote opportunities for students and early career researchers to gain education and training in world class research while enhancing diversity, equity, inclusion, and accessibility.

Centers are expected to undertake sustainable activities that advance knowledge, empower resilient communities, and generate discovery of innovative solutions at a regional and/or global scale.

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.

- Paul Raterron, OISE, telephone: (703) 292-8565, email: globalcenters@nsf.gov
- Karen R. Lips, OISE, telephone: (703) 292-5133, email: globalcenters@nsf.gov
- Wenda Bauchspies, OISE, telephone: (703) 292-5034, email: globalcenters@nsf.gov
- Hannah Perry, OISE, telephone: (703) 292-7358, email: globalcenters@nsf.gov
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- Yulia Gel, MPS, telephone: (703) 292-7888, email: ygel@nsf.gov
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- Jeremy Koster, SBE, telephone: (703) 292-8740, email: jkoster@nsf.gov
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- Clifford Weil, telephone: (703) 292-4668, email: cweil@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
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- STEM Education
- 47.079 --- Office of International Science and Engineering
- 47.083 --- Office of Integrative Activities (OIA)
- 47.084 --- NSF Technology, Innovation and Partnerships

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 23

Anticipated Funding Amount: $28,000,000

The estimated number of awards and anticipated funding level are subject to the availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research laboratories, professional societies and similar organizations located in the U.S. that are directly associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI:

An individual may be listed as a PI or a co-PI on no more than one proposal submitted in response to this solicitation. Proposals exceeding this limit will be returned without review in the reverse order received.

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 Research.gov: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
  - 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: https://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:**

  Not Applicable

C. Due Dates

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

  May 10, 2023

  Track 1 GC Implementation

- **Submission Window Date(s)** (due by 5 p.m. submitter's local time):

  April 12, 2023 - May 10, 2023

  Track 2 GC Design

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria 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

Recognizing the critical value of international partnerships to advance research that addresses global challenges, this competition will support cutting-edge, interdisciplinary, use-inspired research on climate change and clean energy with international partnerships fostering novel breakthroughs and/or influencing policy. Awards will promote the creation of prominent, enduring, international centers of research excellence that advance knowledge, empower communities, and generate discovery and innovative solutions at the regional and/or global scale.

Successful proposals will be driven by a bold vision for high-impact, use-inspired research Centers along with a clear strategy to leverage funding to integrate diverse perspectives from different disciplines, international partners, and stakeholder groups into the research. They are expected to demonstrate the potential to scale up and expand their research, while building a scientific and stakeholder community potentially able to carry out the work beyond the Center funding period.

Awards will enable research at the leading edge of science and engineering by facilitating partnerships with others nationally and internationally, by educating and preparing a diverse, world-class research workforce, and by furthering international collaboration. The partnerships should also enhance diversity, equity, inclusion, and accessibility (DEIA) in both research and education.

II. PROGRAM DESCRIPTION

A. PROGRAM OBJECTIVES

- Create physical or virtual international research Centers that advance innovative, interdisciplinary, use-inspired research and education on climate change and/or clean energy to address societal challenges through international collaboration and multi-stakeholder engagement.
- Promote international collaboration for advantages of scope, scale, flexibility, expertise, facilities, and/or access to specific geographic locations, to enable advances that could not occur otherwise.
- Expand opportunities for students and early career researchers to gain education and training in world class research while enhancing diversity, equity, inclusion, and accessibility.
- Engage multiple partners and stakeholders through practices such as: Team Science, Engaged Scholarship, and Knowledge-to-Action frameworks to empower them to solve urgent societal challenges at a regional scale.

B. PROJECT CHARACTERISTICS

The research Centers should involve multiple constituencies and institutions. Proposers should be tackling scientific challenges that are larger in scale than can be accomplished by a single institution or a single discipline.

Centers may involve collaboration with other international research partners beyond the initial bilateral or multilateral collaboration with Partner Countries.

Centers will support use-inspired research directed by an ambitious research agenda to address a societal challenge of regional or global importance related to climate change and/or clean energy that requires international collaboration and multi-stakeholder engagement. Successful proposals will address the societal, behavioral, economic, and/or policy dimensions of the challenge within the submitted document.

The Center must have a clearly defined research focus and demonstrate how international collaboration will produce innovative use-inspired outcomes in research and education. While the research should be fundamental i.e., full implementation of solutions is not supported, it should also have the potential to benefit communities while informing the actions of stakeholders toward foreseeable potential applications.

Centers must integrate broadening participation activities fully into the scientific plan, recognizing that such activities not only help diversify the research workforce, but fundamentally impact how the science is conducted and who is involved and included in the development of scientific ideas.

Centers must have clear research and educational plans with identified milestones, potential roadblock and ways to overcome them, as well as expected deliverables and outcomes with associated timelines within the funding-period timeframe.

Teams proposing research to address societal challenges that disproportionately impact specific groups in the U.S. and/or abroad are strongly encouraged to engage stakeholders from the impacted groups as key partners in the research endeavor.

Centers may exhibit diverse forms of organization, collaboration, and operation suited to support their priorities, approaches, and practice.

Centers will identify and implement a structure that will enable interaction between the various institutions, stakeholders, and communities. The center may be completely virtual, or it may have a physical central location; however, the Global Centers (GC) program will not fund the building of a new physical infrastructure. Regardless, the chosen structure must have plans in place for enabling research across disciplines and institutions.

Over the life span of the Center, it is anticipated that the research pursued and the activities it engages in may evolve. Thus, it is important that a center can evolve its leadership, approach, and structure to best serve all the participants and the evolving scientific focus. However, during the funding period, any change of scope would have to be justified and agreed upon by the funding agencies.

Each Center should identify who are the relevant stakeholders and how it will engage them in a manner that will help drive the basic science research priorities. Stakeholders may be local communities, government (local, state and/or federal) agencies, nonprofit organizations, private sector businesses, and other entities.

A Center may be focused on a geographic region but should explore science that is transferable to other locations or globally.

Centers must provide meaningful international research experiences for U.S. and international partners' students.

The Center should have a vision and strategy for potential growth, scaling up, and building a relevant community able to potentially carry out the work beyond the funding period. The proposal should describe the expected results that are associated with project milestones and expected/projected growth of the Center based on an explicit implementation strategy.

C. FUNDING TRACKS

NSF recognizes that some U.S. research teams are ready to implement Global Centers in collaboration with partners and stakeholders in Australia, Canada, and/or the United Kingdom, while others will need time and resources to complete the design of Global Centers with international partners globally, whether from the above partner countries or from other countries, notably from regions of the world that are disproportionately affected by climate change. The former teams may submit proposals to the Track 1 competition, while the latter teams may submit proposals to the Track 2 competition.

Track 1: Global-Center Implementation: Research Partnerships with Australia, Canada, and the United Kingdom. This track will support proposals to advance use-inspired research in climate change and/or clean energy that involve U.S. teams supported by NSF, in collaboration with foreign teams supported by funding agencies based in FY2023 partner countries, i.e., Australia, Canada, and the United Kingdom. Proposals must be aligned with topics identified by NSF and the international funding partners. Award expected duration is 4 to 5 years. NSF anticipates making awards of up to $5 million each, with international funding agencies expected to support roughly comparable effort by their own researchers in parallel; see section II.D.1.c for details on the specific documentation that needs to be submitted to the partner agencies to assess award eligibility. For the FY2023 competition, the funding partner agencies are CSIRO, NSERC, SSHRC, and UKRI. Track 1 proposals must include at least one institution in the U.S. partnering with at least one institution/researcher in at least one of the three partner countries (refer to section II.D.1.c) eligible to receive funding from the respective funding partner agencies. Proposals can involve researchers and/or stakeholders in several of the partner countries. Beyond these countries, proposals may also involve partnership with stakeholders in other countries around the globe, provided that researchers from countries other than FY2023 partner countries secure their own sources of funding. It is expected that future Track-1 competitions will require involvement of funding partners in funding implementation proposals. The official partner countries and number of funding partner agencies involved in future Global Centers competitions may change.

Track 2: Community-driven Global Center Design. Track 2 awards will provide seed funding for U.S.-based researchers wishing to coordinate efforts to design a Global Center for the next NSF Global Centers competition. Track 2 proposals may involve partnership with researchers and stakeholders from any country globally but proposals must address use-inspired research in climate change and/or clean energy. NSF anticipates funding up to $250,000 total per award of 2-year duration. In this Track, foreign collaborators, i.e., investigators working in non-U.S. institutions, need to secure their own source funding; they are encouraged to explore funding opportunities in their respective countries. Proposals will be accepted in any field or combination of fields supported by NSF. Track 2 will support coordination efforts to bring together new teams of researchers to develop research questions and viable partnerships, conduct landscape analyses, build research networks, synthesize data, and/or conduct exploratory research necessary to develop the scientific infrastructure to launch a Global Center in the future. We invite proposals from U.S.-based researchers that include global experts from any country, notably scientists and stakeholders based in regions of the world disproportionately affected by climate change.

Track 2 proposals must demonstrate a clear path toward the development of a future Global Center. Proposed activities must engage with the challenges involved in meeting the program goals described above and engage students and early-career researchers in the identification of knowledge gaps and professional skills for participation in international partnership to address a clearly identified global challenge.

While Track 2 is intended to help build research teams capable of competing for Track 1 awards in subsequent competitions, recipients of Track 2 awards are not guaranteed a future Track 1 award. Nor it is expected that proposers first compete for Track 2 awards prior to competing for Track 1 awards in subsequent competitions. It is expected that future Track 1 competitions will require involvement of funding partners in funding implementation proposals. The official partner countries and number of funding partner agencies involved in future Global Centers competitions may change.

Global Center Tracks at a Glance:

Track	International partnership	Review process	Award duration	NSF budget/award	Envisioned Activity
1 - Global Center Implementation	Australia, Canada & the U.K. (primarily)	NSF-led; Canada & the U.K. participate	4 to 5 years	up to $5 million	Collaborative research program

2 - Global Center Design	Any country	NSF only	2 years	up to $250,000	Research coordination effort

D. SUPPORTED RESEARCH THEMES

Proposals are accepted in any field or combination of fields of science, engineering, or education research supported by NSF, or convergent fields that cut across NSF-supported disciplines (see the NSF definition of convergence). Proposals must focus on a clear research area within climate change and/or clean energy. Projects that focus on expanding operations or building capacity abroad are not appropriate for this call.

Proposers are encouraged to contact one of the cognizant Program Directors listed on the program webpage prior to submission.

D.1 - Track 1: Collaborations with International Funding Partner Agencies

FY2023 counterpart international funding organizations - namely CSIRO in Australia, NSERC and SSHRC in Canada, and UKRI in the United Kingdom - are partnering with NSF to enhance opportunities for collaborative activities between U.S.-based investigators and their collaborators abroad. NSF will coordinate and manage the review of proposals in consultation with the participating international funding organizations, according to the respective arrangements with NSF. Relevant information about proposals and unattributed reviews of proposals may be shared between the participating organizations as appropriate, according to the respective arrangements with NSF (see Funding partner-agency specificities below).

For Track 1 proposals that are highly reviewed and ranked by NSF, NSF will coordinate and manage the final decision of awards in consultation with the participating funding partner organizations, according to the respective arrangements with NSF.

For more information as to what is required of the international collaborators in order to qualify and apply for funding from their respective funding agency to support their participation in the Center, refer to Section II.D.1.c below. U.S. PIs must be in close communication with their international collaborators and ensure that all necessary eligibility requirements are satisfied. Prior to final NSF recommendations, PIs whose proposals are considered for Global Centers awards may be asked to submit additional information to NSF; their foreign collaborators may be asked to submit additional information to their respective funding partner organizations. It is important to note that, because Track 1 of this program is designed as being truly collaborative between NSF and the funding partner agencies listed above, NSF will consult with the relevant partner agencies according to their respective arrangements with NSF before making final award or decline decisions.

Within the general theme of climate change and clean energy, proposals may address a wide range of research projects that may lead to novel directions, including those not foreseen by the funding partner agencies. Further, these research topics should remain broad enough in scope to allow for potential intersections with the priorities and interests of partnering funding agencies, and to maximize the potential for mutual interests to emerge.

While climate-change and clean-energy research has traditionally focused on natural and physical sciences and engineering, partnering funding agencies all recognize the need to involve the social, behavioral, and economic sciences as well. Proposers are therefore strongly encouraged to explore and involve the full range of disciplinary and multi-disciplinary approaches that address research needs under the climate-change and clean-energy general theme. For example, in identifying pathways to decarbonization, topics may include net-zero pathway science using assessment models which consider clean energy sources and technologies together with social and economic drivers.

Broadening participation in STEM is an NSF priority shared with funding partner agencies. The proposers are strongly encouraged to engage with underrepresented communities in creative and meaningful ways and foster notably tribal and indigenous community and scientific engagement when applicable.

Please see the "*Additional Solicitation Specific Review Criteria*" (Section VI.A.1) for further guidance.

D.1.a - Climate Change Themes

Proposers may propose a wide range of research projects within the general theme of use-inspired research on climate change. Appropriate research themes may include, but are not limited to, the following ones or a combination of those:

- Food and/or water resources and security on the changing planet
- Climate-driven air quality issues
- Impacts of climate change on the evolutionary ecology of diseases
- Biodiversity protection/ conservation/ restoration
- Pollinator health
- Ecosystem health and restoration
- Climate-ready/resilient agriculture / aquaculture / fisheries
- Climate-ready/resilient cities and infrastructures
- Green/blue infrastructures
- Nature based solutions to climate change
- Climate-resilient economy and supply chain
- Carbon-neutral society/circular carbon economy
- Greenhouse gas mitigation
- Decarbonization/Carbon Capture/Direct Air Capture
- Building knowledge and guidance into best practices & policy
- Climate risk assessment tools tailored to local or global needs
- High resolution climate projections modeling & local/global impacts and concerns
- Disaster resilience, e.g., flood/sea level rise-, storm-, heat wave-, extreme weather, landslide/debris flow, wildfire-resilience
- Climate driven human migration and societal and economic ramifications
- Broad-scale atmospheric, oceanic, or terrestrial changes due to climate change & mitigation solutions
- Transport resilience in the changing planet
- Economics, policy, social sciences for climate-resilience solutions
- Circular bioeconomy for food, feed, energy, and products
- Computational methods and data sciences for climate risk analytics

D.1.b - Clean Energy Themes

Proposers may propose a wide range of research projects within the general theme of used-inspired research on clean energy. Appropriate research themes may include, but are not limited to, the following ones or a combination of those:

Battery innovation and recycling
- Clean energy storage
- Clean/Green Hydrogen production, storage, and distribution
- Sustainable energy sources (e.g., wind-powered, hydro-power)
- Offshore wind energy
- Development of innovations in continuous ocean energy sources (tidal, wave, current, thermocline, etc.)
- Solar-powered energy sources
- Other clean-energy sources (e.g., geothermal, hydroelectric)
- Environmental cost of new scaled-up energy technology
- Building knowledge and guidance in new energy source development into best practices & policy
- Grid physical & economical resilience
- Negative emission technologies (which remove harmful pollutants such as GHG's from the atmosphere)
- Novel materials discovery and low temperature catalysts
- Low power computing solutions
- Critical minerals exploration and green/clean mining
- Design approaches to Net Zero
- Understanding the sustainable and equitable low-impact behaviors and practices fostering societal resilience in a Net Zero way of living
- Consumer acceptance and behavior of Net Zero solutions
- Bio-based manufacturing and biopolymers
- Negative carbon energy sources (including bioenergy and direct air carbon capture and storage)

D.1.c - Funding Partner-Agency Specificities

Partnership with Australia

IMPORTANT NOTE: This section applies to CSIRO proposals and awards to Australian institutions and researchers only.

Collaborations with partners in Australia will be through the Commonwealth Scientific and Industrial Research Organization (CSIRO). CSIRO recognizes that global collaboration is critical in addressing the most pressing challenges the world faces today. Through its Missions Program, CSIRO seeks to encourage collaboration across our innovation system to deliver greater value to the nation in addressing complex societal challenges.

CSIRO will support proposals that deliver on the objectives of one of the Missions identified in CSIRO's Missions Program. The CSIRO Missions Program seeks to solve society's greatest challenges through science and technology and has a range of Missions that seek to address the research themes identified under this program. All proposals should contain a section that clearly describes how the proposed Global Center aligns with one or more of CSIRO's Missions that relate to climate change or clean energy. Please specify exactly which Mission your proposal aligns with and describe how your centre will contribute to or support the objectives of the Mission. You may select any of the Missions, including those labeled "Developing Missions" at https://www.csiro.au/en/about/challenges-missions

Note that proposals that focus on the following are especially desirable:

- **Pathways to Net Zero**, including: solutions for hard to abate industries ("the last 20%") that do not have mitigation pathways; integrated decarbonization pathways at multiple scales; regions and precincts in net zero transitions; and reducing methane emissions.
- **Integrated Energy Systems Intelligence**, including: integrated multi-energy system transformation; integration and optimization of distributed energy resources; and multi-energy system digitalization.
- **Critical Energy Minerals and Energy Storage**, including: minerals processing; supply, demand, economic resource and criticality assessment; energy storage and batteries; materials and devices; and systems and integration.
- **Enabling the Hydrogen Industry**, including: mobility as an early target market; hydrogen utilization in heavy industry; and hydrogen energy systems integration.

For further information about the preferred topics and aligned Missions, please visit: https://www.csiro.au/en/work-with-us/international/north-america/national-science-foundation

The total funding from CSIRO will be at a maximum of AUD $7m over five years for Australian components in the Track 1 Global Centre Implementation Awards. The number of successful awards will be subject to the availability of funds.

Application information: CSIRO recognizes that tackling clean energy challenges requires multidisciplinary and transdisciplinary approaches and expects that partnerships may involve researchers from a range of fields. CSIRO will particularly welcome proposals that seek to work with Indigenous communities and organizations to create Indigenous-driven science solutions.

Information about specific additional requirements and considerations for Australia-based PIs is provided here: https://www.csiro.au/en/work-with-us/international/north-america/national-science-foundation U.S.-based PIs partnering with Australia-based researchers are also strongly encouraged to review and address these requirements and considerations. Notably, these include:

- Applications must demonstrate strong alignment with at least one of the themes identified above.
- Australia-based PIs or researchers must be based in an organization such as a university or an institute (including, but not limited to CSIRO) that has research as its primary purpose.
- Partnerships involving the U.S., Australia and one or more other countries, and multiple partners or constituencies are encouraged.
- Global Centers funded by CSIRO will need to report regularly to CSIRO according to reporting requirements which will be outlined in successful award letters.
- Projects involving human subjects or participants, or vertebrate animals, should follow the **Australian Code for the Responsible Conduct of Research**, along with the requirements of the participants' institutions, submitting documentation to each as appropriate.
- Researchers will be required to acknowledge CSIRO in any reports or publications arising from the grant.

For Track-1 proposals that involve Australia-based researchers CSIRO will allocate funding on the basis of the NSF merit review, including its assessment of alignment with one or more CSIRO Missions.

Partnership with Canada

IMPORTANT NOTE: This section applies to proposals, awards, and requirements for Canadian institutions and researchers only.

Collaborations with researchers in Canada will be supported by the Natural Sciences Engineering Research Council of Canada (NSERC) and the Social Sciences and Humanities Research Council of Canada (SSHRC). Both NSERC and SSHRC are open to topics in both Climate Change and Clean Energy. NSERC is allocating up to CAD$15M over five years while SSHRC is allocating up to CAD$5M over five years to support the activities of eligible researchers across supported projects.

The Global Centers vision is well-aligned with Canada's Climate Science 2050: Advancing Science and Knowledge on Climate Change Plan (CS2050), an effort to identify and understand climate change science and knowledge gaps and guide the collaborative and interdisciplinary scientific efforts needed to inform climate action.

NSERC and SSHRC are open to and encourage the full range of disciplinary, multi-disciplinary and transdisciplinary approaches that address research needs under the Climate Change and Clean Energy themes. Additional information on thematics is available here.

Proposals proposing research in cooperation with Indigenous groups are encouraged to consult tri-agency guidelines on working with Indigenous peoples, available here: Indigenous Research.

Additional information and requirements for Canadian researchers is provided here NSERC - Innovate - Joint research calls. Proposals with NSERC and/or SSHRC as a funding agency partner must additionally submit an application package to NSERC.

Information on application and award processes for Canadians: the Canadian team partnering on a Global Centers proposal (Track 1 or Track 2) must appoint a Canadian researcher who is eligible to receive funds from either NSERC or SSHRC to act as the principal Canadian investigator (the Applicant) on the Canadian portion of the grant. Additional Canadian researchers may be listed as Co-Applicants or Collaborators, but only co-applicants who meet NSERC/SSHRC eligibility requirements are eligible to receive funding. Collaborators are expected to bring their own resources. NSF PIs and Canadian researchers are strongly encouraged to review the eligibility requirements for each agency and address the specific additional requirements requested by NSERC and/or SSHRC for Canadian researchers: NSERC - Innovate - Joint research calls. Note that you can only be the Applicant on one proposal. Proposals that do not meet eligibility requirements will be rejected.

The Canadian team may apply for funding from NSERC and/or SSHRC to support their activities on a Track 1 proposal for up to 5 years. Please refer to the NSERC/SSHRC program literature for funding limits.

Partnerships may involve researchers who are in any field of the social sciences, humanities, natural sciences, or engineering. Proposals with NSERC and/or SSHRC as a funding agency partner must additionally submit an application package to NSERC. Notwithstanding the composition of the research team, the principal Canadian investigator (the Applicant) on the Global Center proposal is responsible for submitting this information on behalf of the Canadian team (co-applicants and collaborators) to NSERC. Instructions for doing so are provided here: NSERC - Forms.

NSERC and SSHRC will review all Track 1 proposals involving Canadian teams and assign NSERC or SSHRC funding to meritorious projects as appropriate. https://www.nserc-crsng.gc.ca/Innovate-Innover/Joint_Calls-Appels_Collaborative_eng.asp.

NSERC and SSHRC will review proposals recommended for funding that involve Canada-based researchers and allocate Canadian funding on the basis of the NSF merit review. Where applicable, NSERC's funding decision will consider the potential risks for Canada's national security pursuant to the National Security Guidelines for Research Partnerships.

Canadian researchers participating in Track 2 proposals may apply for funding from NSERC and SSHRC to support their activities for up to 2 years if they meet eligibility requirements. Please refer to the NSERC/SSHRC program literature for funding limits.

Support for Track 2 proposals is subject to the availability of funds. The application procedure for Track 2 proposals is the same as for Track 1 proposals. Please refer to the program literature for additional information and requirements or contact NSERC/SSHRC staff at RP-Initiatives-PR@nserc-crsng.gc.ca.

The Canadian application package is due at NSERC at the same time as the NSF application. For grants awarded by NSERC and SSHRC, standard NSERC and SSHRC terms and conditions of award, policies, and funding guidelines will apply (the Tri-Agency Guide on Financial Administration (TAGFA)). Recipients of grants awarded by NSERC and/or SSHRC will also need to report to NSERC and/or SSHRC. Recipients must report regularly on how they use the funds from the grant, the activities they carry out and the outcomes of this project. Award letters will include information on reporting requirements.

Partnership with The United Kingdom

Collaborations with partners in the United Kingdom will be through UK Research and Innovation (UKRI).

IMPORTANT NOTE: This section applies to UKRI proposals and awards only.

In the framework of this call, UKRI is currently only able to support Global Centers Implementation Track-1 awards focused on Clean Energy topics. However, subject to budget availability UKRI may be able to support collaborations which include Climate Change topics and applicants should check the UKRI website for full details of funding support available for this call which will be updated periodically to reflect confirmation of UKRI's budget for this activity.

UKRI is allocating up to GBP £18M over five years to support activities of eligible researchers across supported projects. For details of UKRI eligibility rules please see the UKRI website.

This call is aligned with UKRI's Strategic Theme 'Build a Greener Future', an effort to deliver fundamental change in how we tackle the global climate crisis. Total expected funding from UKRI for United Kingdom components will be a maximum of £18M over five years. The UKRI-supported elements of Global Centers Implementation Track-1 awards are expected to be up to five years in duration. Number of successful awards are subject to the availability of funds and applicants should consult the UKRI website for specific details with regards to costs and funding available for this activity. Details are available here.

UKRI is particularly interested in supporting research and innovation in the technology solutions which will be needed to overcome the last 20% of missions we do not yet have a pathway to mitigate. These solutions must be developed and de-risked now to enable deployment in the 2030's and collaboration internally is key to delivering our outcomes. (The UK has enshrined in law a binding target of achieving Net Zero carbon emissions by 2050).

UKRI has identified four proposed themes which we are particularly interested in seeing ideas in:

1. Negative emission technologies
2. Systems approaches to tackling the 'final 20%'
3. Targeting the difficult to decarbonize
4. Removing the barriers to technology uptake

These themes include cross cutting considerations:

- The sustainability of the solutions proposed
- Solutions need to be able to be implemented in a warmer climate with more extreme weather patterns
- Energy demand reduction opportunities as energy efficiency and usage behaviors (green choices and green behaviors) will change as we decarbonize
- Systems considerations

Further details on the activities which UKRI are keen to support through this activity can be found on the UKRI webpage which contains all relevant information in relation to this activity. Full details are available here.

Information of application for UK-based researchers

NSF PIs partnering with UK-based researchers must appoint a UK-based researcher who is eligible to receive funds from UKRI to act as the principal UK investigator (the UK PI) on the UK portion of the grant. Additional UK researchers may join as co-investigators. NSF PIs and UK researchers are strongly encouraged to review and address the specific additional requirements requested by UKRI from their PIs, which will include eligibility criteria: https://www.ukri.org/opportunity//

Proposals with UKRI as an agency partner must additionally submit an application package to UKRI. The principal UK investigator (the UK PI) is responsible for submitting this information on behalf of the UK co-investigators. Instructions for doing so are provided here.

Partnerships may involve researchers who are in any field of the social sciences, humanities, natural sciences, engineering and physical sciences, or biological and biosciences. Notwithstanding the composition of the research team, the UK members of the team must submit only one package to UKRI. UKRI will review all proposals and assign UKRI funding to meritorious projects as appropriate.

The UK portion of the application package is due at the same time as the NSF package.

UKRI will review proposals recommended for funding that involve UK-based researchers for both Track 1 and Track 2 routes and will allocate UK funding on the basis of the NSF merit review and, where applicable, considering the potential risks for the UK's national security.

For grants awarded by UKRI, standard UKRI award conditions and funding guidelines (https://www.ukri.org/manage-your-award/meeting-ukri-terms-and-conditions-for-funding/) apply.

Grants funded by UKRI will also need to report to UKRI. Recipients must report regularly according to the reporting requirements, which will be outlined in successful award letters.

Multilateral Partnership with two or more Partners Countries

Global Centers projects involving partnership between the US and two or more Partner Countries are allowed. Please refer to the above sections regarding Country-specific interests and topics and any potential restrictions involved in any bilateral collaboration, as those remain true in any proposed multilateral collaboration.

D.2 - Track 2: Community-driven Global Center Design themes

This Track relies on the scientific community to identify critical themes to be investigated in order to address global challenges related to climate change and/or clean energy. Track 2 proposals must demonstrate a clear path toward the development of a future Global Center. There is no limitation regarding the research focus of Track 2 proposals other than the general guidance for the Global Centers program (see Program's Synopsis). The areas/topics of interest can be of local and/or global importance; yet it is expected that the outcomes of the future Center activities on topics relevant to a given location will inform research on other locations or could be transposed globally. The PI team must also identify relevant international partners, scientists and other stakeholders, who need to be associated in the research endeavor. In this Track, foreign collaborators, i.e., investigators working in non-U.S. institutions, need to secure their own source funding; they are encouraged to explore funding opportunity in their respective countries. However, Track 2 proposal PIs are not required to provide foreign funding information in the program description or as complementary information. Please, refer to Sections II.D.1.a & II.D.1.b above for examples of possible research themes on respectively Climate Change and Clean Energy; these lists are not exhaustive. Please see also the "*Additional Solicitation Specific Review Criteria*" (Section VI.A.1) for further guidance.

E. NSF PRINCIPAL INVESTIGATOR

The Principal Investigator (PI) will be the director of the project. The PI is expected to provide intellectual leadership and to be an essential participant in research and related educational activities. The PI will have overall responsibility for the administration of the award, for the management of the project, and for serving as the main point of contact with NSF.

F. VISAS AND PERMITS

PIs are responsible for obtaining any required visas for foreign travel and for providing documentation through the U.S. research institution in support of U.S. visas for foreign counterpart investigators. PIs are also responsible for obtaining research permits and import/export documents where necessary.

III. AWARD INFORMATION

IMPORTANT NOTE: This section applies to NSF awards to U.S. organizations only. Please see section II.D.1.c for international funding partner agency award information and requirements.

Anticipated Type of Awards: Standard and Continuing Grants

Track-1 Implementation awards:

Estimated Number of Awards: 6 to 8, pending the availability of funds.

Anticipated Funding Amount: $25,000,000

Award size is expected to be up to $5 million in total over 4 or 5 years.

The estimated number of awards and anticipated funding level are subject to the availability of funds.

Track-2 Design awards:

Estimated Number of Awards: 10 to 15, pending the availability of funds.

Anticipated Funding Amount: $3,000,000

Award size is expected to be up to $250,000 in total over 2 years

The estimated number of awards and anticipated funding level are subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research laboratories, professional societies and similar organizations located in the U.S. that are directly associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI:

An individual may be listed as a PI or a co-PI on no more than one proposal submitted in response to this solicitation. Proposals exceeding this limit will be returned without review in the reverse order received.

Additional Eligibility Info:

For Track-1 proposals, eligibility criteria of all partner agencies involved in a given proposal must be met for the proposal to be compliant. Please refer to the country specific partnership instructions (section II.D.1) for additional country-specific eligibility criteria.

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 Research.gov or Grants.gov.

- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- 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: (https://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) 292-8134 or by e-mail from nsfpubs@nsf.gov.

See PAPPG Chapter II.D.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

IMPORTANT NOTE: This section applies to NSF awards to U.S. organizations only. Please see section II.D.1.c for partner-agency award information and requirements.

Proposals should include the components described below. Consider these important notes.

Proposals that exceed the specified page limitations given below will be returned without review.

No additional information may be provided by links to web pages in the Project Description.

Separately submitted collaborative proposals from U.S.-based organizations are not allowed in this competition. The proposal must be submitted as a single integrated proposal by the lead U.S. organization, with proposed sub-awards to the other involved U.S. organizations. Simultaneous submission of proposals from multiple U.S. organizations will not be accepted.

U.S. Principal Investigators are required to have their foreign collaborators secure their own funding, consult their funding agencies to determine whether they are eligible to submit a proposal, and account for the agency submission requirements. NSF policy on funding foreign organizations can be found in the PAPPG, Chapter I.E. For Track-1 proposals, see additional information in section II.D.1.c of this solicitation detailing specific requirements from partner funding agencies.

If the project involves human subjects, the Institutional Review Board (IRB) of the submitting organization must certify that the proposed project is in compliance with the Federal Government's Common Rule for the protection of human subjects. IRB information will be required before an award can be made. For more information regarding the protection of human subjects, consult https://www.nsf.gov/bfa/dias/policy/hsfaqs.jsp and PAPPG Chapter II.E.5.

If the project involves the use of live vertebrate animals, the project must be approved by the submitting organization's Institutional Animal Care and Use Committee (IACUC) before an award can be made. For more detail, see PAPPG Chapter II.E.4.

PIs proposing work in the Arctic or Antarctic Polar Regions should contact the Office of Polar Programs program officer associated with the program most closely aligned with the proposed research for guidance on submission (https://www.nsf.gov/div/index.jsp?div=OPP).

PIs proposing research that requires access to research vessels are encouraged to check general information at https://www.nsf.gov/news/news_summ.jsp?cntn_id=191729&org=OCE.

1. COVER SHEET:

The title of the proposal must be preceded by "Global Centers Track *n*", where "Track *n*" indicates either Track 1 (Implementation) or Track 2 (Design).

Identify the proposed Project Director as the Principal Investigator.

Although NSF recognizes that international collaborators play an integral role in partnerships, list only participants as PI or co-PIs affiliated with U.S. organizations.

Check the international cooperative activities box and select the countries involved from the pull-down list.

2. PROJECT SUMMARY (1 page maximum):

The Project Summary must consist of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity (for additional instructions, see the PAPPG).

Provide a clear and concise description of the project, including the research vision and goals.

List the foreign countries involved and indicate the unique opportunities that the international partners bring to the project.

Write a summary that is informative to those working in the same or related fields and, as far as possible, understandable to a scientifically or technically literate lay reader.

3. PROJECT DESCRIPTION (20 pages maximum):

In addition to the requirements contained in the PAPPG, the guidelines below must be followed. Note that the 20-page maximum includes the PAPPG required section labeled "Broader Impacts", Results of Prior NSF Support, and all tables, figures, and other graphical data. Program Objectives (section II.A. above) should be considered in items a) through e) below.

a) Research vision, goals, and approaches:

For **Track 1,** describe the research vision, goals of the Center, the chosen scientific and technical approaches, and the expected outcomes and milestones. Illustrate how the proposed use-inspired research represents important advances achievable only through international collaboration and multi-stakeholder engagement. Explain how the Center will foster diversity, equity, inclusion, and accessibility (DEIA) and promote foreseeable societal benefits. Consider answering some of the questions listed below when structuring the project description.

- What is the climate-change and/or clean-energy scientific challenge to be addressed?
- What is the use-inspired nature of the proposed research? Highlight the foreseeable benefits to society expected from the project outcomes. These should help assessing and/or mitigating climate-change impacts on society, people, and communities, and/or fostering clean-energy solutions.
- What roles the multi-sector stakeholders have in the Center (including but not limited to academia, private sector, public sector, philanthropies, communities)?
- What is the vision and strategy for growth, scaling up, and building a relevant community potentially able to carry out the work beyond the Center funding period?

For **Track 2,** proposers should describe how they will accomplish each of the previous items in the context of a research and coordination effort aiming to develop a future Global Center. It is expected that they will describe efforts to bring together new teams of researchers, develop research questions and viable partnerships, generate new ideas, conduct landscape analyses, build research networks, synthesize data, and/or conduct exploratory research necessary to develop the scientific infrastructure to launch a Global Center in the future.

b) International collaborators and other partners:

For **Track 1**, explain how international collaboration and multi-sector partnerships will be integrated into the overall research plan. In your description, clearly explain:

Why is the international partnership required? What are partners' contributions and roles in the project?

Who are the international collaborators and why are they involved in the project? Highlight specific and unique contributions (e.g., expertise, facilities, sites, data, approaches/methods, opportunities, etc.) of each international partner. Explain how international researchers, students and their organizations are integrated in the project and emphasize the expected benefits for the US and international partners.

What different stakeholder partners are included in your proposal (including but not limited to academia, private sector, public sector, community groups, philanthropies, etc.) and what are their roles in the project?

Identify who the partners from different sectors are and explain why they are included. How will their involvement help you grow your research and transform it into a larger effort?

For **Track 2,** proposers should address each of the previous items in the context of a research and coordination effort aiming to develop a future Global Center.

PIs should explain their plan to integrate researchers from non-anchor partner countries, notably scientists and stakeholders based in regions of the Global South disproportionately affected by climate change or who have innovative ideas regarding clean energy.

Describe the plan for how your planning and coordination are designed to lay the foundation for a full-scale implementation proposal in future years. You should discuss changes in the scientific personnel, partnerships, funding and other resources you would expect to incorporate into for a full-scale proposal.

c) Educational Activities:

Note that PIs must provide a Student Mentoring Plan for the U.S. undergraduate and graduate students involved in the project (see Section V.A.8 Supplementary Documentation).

What training and/or educational activities are required to address the identified scientific challenge(s) and train the next generation of a globally engaged workforce? How will the international partnership enrich the student training experience? Note that broadening participation of members of under-represented groups in STEM and empowering under-served communities is especially encouraged.

For Track 1 proposals: see Section II.D.1.c. for additional requirements from partner funding agencies. Note that UKRI does not fund student salary.

d) Project Management Plan (PMP): the PMP is an important part of the proposal and a mandatory document to provide as supplementary documentation (see details in Section V.A.8).

e) Other Considerations:

PIs should consider the following suggestions in developing their implementation proposals (Track 1) or planning their Center design effort (Track 2):

- Vision, Motivation, and Impact: What research relevant to Climate Change and Clean Energy will be undertaken by the Center? How will understanding of these topics in an international context be advanced by the proposed center? How is this research well suited to integrate stakeholder engagement and broaden participation? What strategies will be used to broaden participation in STEM? How will integration of broadening participation and DEIA shape the science undertaken by the Center? How will the center be structured to enable the goals?

Proposers should:

- Identify a central theme that will advance the understanding of climate change and/or clean energy, engage stakeholders and broaden participation in international STEM research in an integrated fashion.
- Connect the Center theme to overarching basic scientific questions in climate change and/or clean energy in an international context.
- Present clear objectives and outcomes for the Center. These should be related to the basic science questions and be formulated so that progress and success can be assessed.
- Articulate a common agenda for the Center that reflects a collective understanding of research challenges, challenges to broadening participation, and challenges of integrating research and broadening participation along with DEIA.
- Develop an overall framework of the Center structure necessary to conduct the proposed research and activities, including technical infrastructure, which facilitates collaborative activities and the implementation and accomplishment of specified activities and targeted outcomes.
- Explain the unique opportunity that an international, interdisciplinary and integrated Center will provide, as well as describe what will be achieved in the center mode that could not be achieved with group or individual support.
- Describe the potential legacy and international impact of the proposed Center.
- Integration and Partnerships: Which organizations are proposed partners within the center? What unique expertise, perspective, and talent does each partner bring to the center necessary to conduct the proposed science? What evidence is there that partnerships will be able to successfully work together towards the vision of the proposed center? How will activities be integrated across the partners?

Proposers should:

- Describe the academic partners that will participate in the proposed Center, articulating the unique contribution they bring, as well as how the theme of the Center aligns with institutional priorities and strengths.
- Describe the non-academic partners that will participate in the proposed Center. Articulate the extent of any existing relationships with non-academic partners. Provide a plan for how non-academic partnerships, especially with community groups and stakeholders, will be strengthened by Center research and activities. For partnerships with federal agencies, articulate how research conducted by the Center will be beneficial to the federal partners, but remain fundamental research in alignment with the NSF mission.
- Describe any partnerships that build on existing NSF investments like major facilities, centers and center-like activities, or other Federal investments. Articulate how those previous/ongoing investments will be leveraged in new ways.
- Describe partnerships that broaden participation. Articulate how any existing broadening participation efforts of partners will be leveraged and amplified by hub activities.
- Articulate how the partnerships in the proposed center will be nurtured to build long lasting relationships, whose impact and integrated activities might continue beyond the award funding period.
- Metrics of Success and Evaluation: What will constitute success for a center? How will the multiple and integrative activities of a center be evaluated?

How will the broadening participation efforts be assessed? What components of the center will promote building a community potentially able to continue the effort beyond the center funding period?

Proposers should:

- Describe how progress will be measured and reported. Note that the cost of hiring external evaluators can be included in the requested budget.
- Detail an evaluation plan which may include benchmarks, indicators, logic models, road maps, or other evaluative methods to document progress towards objectives and outcomes.
- Outline a process to develop appropriate ways to collect and analyze metrics data across the diverse and evolving activities of a center.
- Present current demographic data related to broadening participation (when available). These data should be specific to the group(s) the center will work with to broaden participation and in a format that can be used for benchmarking and measuring progress on broadening participation.
- PIs should budget within travel for a minimum of 2 PI/Co-PIs to travel to NSF 3 times over the award period for a PI meeting and/or to report to NSF on center progress.

f) Results from Prior NSF Support (3 pages maximum):

PI and co-PIs who have received prior NSF funding must provide information on the prior award(s), and a summary of the results of the completed work, including accomplishments. The results must be separately described under two distinct headings, Intellectual Merit and Broader Impacts. Individuals who have received more than one prior award (excluding amendments) must report on the award most closely related to this proposal. Required information is described in the PAPPG.

4. REFERENCES CITED: Cite references relevant to both the research and educational plans, using the standard NSF format as per the NSF PAPPG.

5. BIOGRAPHICAL SKETCHES: Only include the biographical sketches of PIs, co-PIs, and other Senior Personnel affiliated to U.S. organizations in this section of the proposal. The biographical sketches must conform to the NSF format as specified in the NSF PAPPG.

Instructions for providing biographical sketches of foreign collaborators are provided below in section V.A.8, Supplementary Documentations.

For both U.S. and foreign personnel biographical sketches, emphasize information helpful for understanding the strengths, qualifications, and specific impact the individual brings to the GC project.

6. CURRENT AND PENDING (Other) SUPPORT: Include current and pending (other) support for the PI and co-PIs only in this section of the proposal.

7. FACILITIES, EQUIPMENT and OTHER RESOURCES: Describe available facilities and major instruments in both the U.S. and abroad in sufficient detail to allow assessment of the adequacy of resources available to perform the effort proposed.

8. SUPPLEMENTARY DOCUMENTATION: Proposals that do not include the required supplementary documents, or that include non-required documents, will be returned without review.

Letters of Collaboration: These documents are required for all collaborators involved in proposed work, except for foreign collaborators from partner countries involved in implementation Track 1 proposals*. Include only official letters with specific commitments of resources from participating institutions, or organizations expected to receive subawards, or from organizations that will provide resources for the project. Letters are limited to two pages each and must indicate 1) what infrastructure, resources, expertise etc. will be available to participants at the international site, 2) what roles the foreign collaborators will play in the project, and 3) how foreign collaborators and/or their organizations will benefit from participation in the project. This solicitation requires these descriptive letters of collaboration in lieu of the standard PAPPG language. Letters are limited to two pages each.

*For **Track 1** proposals, specific documentation is required from foreign collaborators from partner countries. See section II.D.1.a, as well as the section "Foreign Collaborator, Organization, and Funding Information" below.

Data Management Plan (2 page maximum): For both Track 1 and Track 2 proposals, describe how data and information resulting from the proposed project will be managed with details on how data will be shared among partnering researchers and institutions. See details below regarding NSF Data policy and specificity in the framework of the Global Centers program.

The Global Centers program is committed to the establishment, maintenance, validation, description, and distribution of high-quality data sets. Per the NSF policy on Dissemination and Sharing of Research Results, as stated in the Proposal & Award Policies & Procedures Guide (PAPPG), Principal Investigators (PIs) are expected to share with other researchers, at no more than incremental cost and within a reasonable time, the data, samples, physical collections, and other supporting materials created or gathered in the course of work under NSF grants. Key considerations regarding data sharing in the framework of the Global Centers program are:

- The definition of "data" is expansive and includes (but is not limited to) the following: full data sets, derived data products (e.g., model results, output, and workflows), software, and physical collections.
- The proposal Data Management Plan (DMP) should clearly describe what data will be collected, what analyses will be done, when data collection is considered "final," and how and when the project will provide open and timely access to data during and after the project.
- PIs are strongly encouraged to identify long-lived disciplinary repositories most appropriate for the data types to be collected.
- PIs are required to provide updates on the status of data sharing and archiving in project reports.

Furthermore, to the extent possible data should be made compliant with the FAIR Principles (Findable, Accessible, Interoperable, and Reusable) and CARE Principles (Collective Benefit, Authority to Control, Responsibility, Ethics) for Indigenous Data Governance.

Final Reports for all awards should include a statement describing how the data policy requirements have been met.

Postdoctoral Researcher Mentoring Plan (1 page maximum): If the project requests funding to support any postdoctoral researcher(s), the proposal must include a description of mentoring activities that will be provided for such individuals.

Student Mentoring Plan (2 pages maximum): Proposals that request funding to support undergraduate and/or graduate students at any participating U.S. institution must upload as Supplementary Documentation a mentoring plan that describes any recruitment, training and/or other activities to be provided to the students and the mentors.

Clearly identify what training and/or educational approaches or methodologies are required for the project. Highlight innovative educational approaches, tools, or technologies. How will these approaches be suitable for training the next generation of a globally engaged workforce? How will the project and the international

collaboration offer opportunities for enriched training experiences that will allow research trainees to develop relevant technical skills, as well as professional skills such as leadership, communication, collaboration and entrepreneurship?

Broadening participation of members of groups under-represented in STEM, empowering under-served communities, and collaborating with organizations in EPSCOR jurisdictions, primarily undergraduate institutions (PUI) and/or other minority serving institutions (MSI), and non-research intensive colleges and universities, is especially encouraged. Comment on how you will measure your success in teaching/learning and how the project will promote DEIA in STEM.

Foreign Collaborator, Organization, and Funding Information (required for Track 1 only): Track 1 proposals must provide the biographical sketches of all participating investigators affiliated with a foreign organization in partner countries. The biographical sketches must conform to the NSF format as specified in the NSF PAPPG.

Track-1 Proposals must provide a detailed budget for the funds requested by their foreign collaborators to partner funding agencies in partner countries as listed in section II.C. Proposals not providing detailed budget requested to funding partner agencies will be returned without review.

For proposals involving Canada-based researchers, the detailed budget for the funding requested from NSERC and/or SSHRC should only include NSERC or SSHRC eligible direct costs of research and should be expressed in Canadian dollars. All expenditures are subject to the principles and directives governing the appropriate use of grant funds outlined in the Tri-agency guide on financial administration. There should be no duplication in funding between items on budgets submitted to NSERC/SSHRC and budgets submitted to other funding partners.

When applicable and available to the PI(s), both Track 1 and Track 2 proposals should provide information on the support already available for foreign collaborators to carry out the proposed work, including the name of the counterpart agency or agencies.

Project Management Plan (PMP) (3 pages maximum): The PMP is an important part of the proposal and a mandatory document to provide as supplementary documentation.

Track 1 proposals should describe the overall structure of the partnership, notably: (1) list the partners and stakeholders (lead individuals and institutions), (2) explain the organizational relationships and reporting structure related to the specific goals and objectives of the Center, (3) describe the processes used to prioritize center activities, and (4) articulate the mechanisms in place to allow the Center to evolve as science priorities evolves. The PMP should include a timeline that specifies milestones and expected completion dates with an anticipated mid-project review by NSF to assess progress toward the Center's stated goals and objectives.

The PMP should also provide information on the communication plans; coordination of data and information flow; allocation of funds and personnel; and other specific issues relevant to the management of the proposed activities. Effective integration of all partners into the project effort is considered integral to success and ultimately to scalability of the project. The PMP should notably clearly answer the following questions:

What is the strategy to allow for effective management of the research and educational components of the project, including integration of all partners and stakeholders into a well-functioning team; relevant collaborative governance and management; procedures to phase research aspects in and out when needed?

What is the vision and strategy for potential growth, scaling up, bringing in new partners, scaling the research up, and building a relevant community potentially able to carry out the work beyond the Center funding period?

Track 2 proposal PMP should describe how the proposed activities would provide a foundation from which to develop an Implementation proposal. Any information to the management of the future Global Center should be included in the PMP.

Safe and Inclusive Work Environments Plan (2 pages maximum): All proposals submitted to this solicitation that include research that will be conducted off-campus or off-site must submit a plan for safe and inclusive working environments as a supplemental document that will be considered under the broader impacts review criterion. This supplemental document is in lieu of the required plan associated with the certification called for in Chapter II.E.9 of the PAPPG, NSF 23-1). More information regarding review of the plan is provided under Solicitation Specific Review Criteria.

It is NSF policy to foster safe and harassment-free environments wherever science is conducted. Work conducted off-campus or off-site should be an enriching experience for everyone and help draw researchers to STEM research. By requiring advanced planning and attention to maintaining an inclusive environment, NSF is working to ensure that off-campus or off-site research is safe and inclusive for all participants.

Off-campus or off-site research is defined as data/information/samples being collected off-campus or off-site, such as fieldwork and research activities on vessels and aircraft. The plan must be no longer than two pages.

The plan for safe and inclusive working environments must include:

- a brief description of the field setting and unique challenges for the team
- the steps the proposing organization will take to nurture an inclusive off-campus or off-site working environment, including processes to establish shared team definitions of roles, responsibilities, and culture, e.g., codes of conduct, trainings, mentor/mentee mechanisms and field support that might include regular check-ins, and/or developmental events;
- communication processes within the off-site team and to the organization(s) that minimize singular points within the communication pathway (e.g., there should not be a single person overseeing access to a single satellite phone); and
- the organizational mechanisms that will be used for reporting, responding to, and resolving issues of harassment if they arise.

Projects requiring access to restricted sites or resources: Projects that require access to areas that have regulated or restricted entry, or require restricted data or samples, must include a letter of collaboration from the authority that controls access, samples, or data. Also, the treatment of such data and samples must be discussed in the data management plan.

Projects involving work on sovereign Native/Tribal/Indigenous lands: Proposals that include research in U.S. Native/Tribal communities and/or on Tribal lands must attach a letter or email that confirms community collaboration, or at a minimum community awareness, and permission to work on associated lands from the relevant community organizations or tribal leadership (see U.S. Department of Housing and Urban Development Tribal Directory Assessment tool or National Congress of American Indians tribal directory) as a Supplementary Document. Collaborations should be well justified, in that they represent true intellectual collaboration and utilize the expertise and specialized skills, facilities, and/or resources of the community. Prior to making a funding decision, additional steps may be required as part of NSF's compliance with applicable federal environmental authorities such as the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), and the Endangered Species Act (ESA). In order to support NSF's federal environmental review and compliance obligations, additional information may be requested from the PI. More information can be found in the PAPPG, and the Checklist (referenced in Chapter II.D.2.i.v) may be helpful in evaluating impacts.

Where relevant, arrangements to allocate and share samples and data with the relevant communities should be discussed in the proposal or in the Data Management plan.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

Budget Justification:

A Budget Justification should be provided. A careful and realistic budget that is consistent with the proposed activities will add to the overall strength of a proposal.

Required Costs: Include costs of travel for a minimum of 2 PI/Co-PIs to travel to NSF 3 times over the award period for a PI meeting and/or to report to NSF on center progress. Include costs of travel for project participants for one trip to the Washington, D.C. area to participate in a one-day orientation meeting at the beginning of the project and a 1.5-day Awardee meeting in year 2 of the award.

Allowable Costs for NSF Budget:

Salaries, wages, and fringe benefits for postdoctoral scholars, other professionals, graduate students, secretarial-clerical, or administrative staff who will perform dedicated work on the GC project. A significant portion of direct costs should fund U.S. students conducting collaborative international research-related activities.

Participant Support Costs: Stipends, travel, subsistence, and other costs of participation for any undergraduate research participant or K-12 teacher included in project activities should be included under Participant Support Costs. Stipends for undergraduate students should be budgeted at rates comparable to those in the Research Experiences for Undergraduates (REU) program (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517) in addition to any travel and subsistence costs incurred while abroad. Travel, subsistence and other costs of participation in GC project meetings and workshops for faculty, researchers and students from non-grantee institutions (who are not included in subawards) should also be included under Participant Support Costs.

Travel: Research-related travel support (i.e., airfare, lodging, meals, and incidental expenses). For living expenses abroad, applicants are encouraged to work with international counterparts to develop realistic budget requests. For example, access to university guest housing or similar facilities should be explored. Cost-effective arrangements should be made for individuals residing at the international site for extended periods and for projects involving on-going exchanges of short-term visitors.

Expenses related to project assessment: Should include fees for internal or external evaluators. Costs should be limited to no more than 10% of total direct costs.

Other Direct Costs: May include GC-specific items, for example, research and education communication linkages between institutions, language training, non-travel costs associated with coordination meetings, and preparation/orientation of students for living abroad.

Equipment: This program is not intended to support the purchase, operation, or maintenance of moderate to large equipment. Only limited equipment costs can be included.

NSF awards normally support the U.S. portion of the collaboration. General NSF rules apply. Consult the PAPPG for details.

C. Due Dates

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

  May 10, 2023

  Track 1 GC Implementation

- **Submission Window Date(s)** (due by 5 p.m. submitter's local time):

  April 12, 2023 - May 10, 2023

  Track 2 GC Design

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For Research.gov user support, call the Research.gov Help Desk at 1-800-673-6188 or e-mail rgov@nsf.gov. The Research.gov Help Desk answers general technical questions related to the use of the Research.gov 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: https://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 Research.gov for further processing.

Proposers that submitted via Research.gov may use Research.gov 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 PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: https://www.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 *Leading the World in Discovery and Innovation, STEM Talent Development and the Delivery of Benefits from Research - NSF Strategic Plan for Fiscal Years (FY) 2022 - 2026*. 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. (PAPPG Chapter II.D.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 PAPPG Chapter II.D.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 other underrepresented groups 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 NSF Merit Review criteria, both Track 1 and Track 2 proposals must address the following criteria specific to the Global Centers call. It is expected that while for Track 1 proposals these criteria will be explained in the framework of an implementation plan – e.g., the international partnership and roles of the partners must be established and detailed – for Track 2 proposals some of these criteria will be explained in the framework of the PI's vision for their future Global Centers project.

- **Interdisciplinarity** (How will the Center utilize interdisciplinary and/or convergence approaches to address a societal challenge related to climate change and/or clean energy?)
- **Used-inspired nature** (What are the foreseeable societal benefits of the research outcomes?)
- **International partnership** (Why is the international partnership required? What are the roles of the foreign partners in the Center?)
- **Roles of stakeholders** (What are the roles of the multi-sector stakeholders (e.g., academia, private sector, public sector, philanthropies, communities) in the Center?
- **Fostering DEIA** (How will diversity, equity, inclusion, and accessibility be integrated into the research and education efforts?)
- **Vision for growth** (What is the vision and strategy for growth and building a relevant community potentially able to carry out the work beyond the Center funding period?)

For Track 1 proposals, NSF will also assess to what extend the proposed activities align with partner-agency priority topics and missions as described in Section II.D.1.c.

For proposals involving research that will be conducted off-campus or off-site, reviewers will be instructed to evaluate the Plan for Safe and Inclusive Work Environments within the Broader Impacts review criterion, specifically:

- Is there a compelling plan (including the procedures, trainings, and communication processes) to establish, nurture, and maintain inclusive off-campus or off-site working environment(s)?
- Does the proposed plan identify and adequately address the unique challenges for the team and the specific off-campus or off-site setting(s)?
- Are the organizational mechanisms to be used for reporting, responding to, and resolving issues of harassment, should they occur, clearly outlined?

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 generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

For Track 1 proposals, partner funding agencies in Canada and the United Kingdom will partner with NSF throughout Global Centers, including the merit review process. NSERC and SSHRC for Canada and UKRI for the U.K. will be invited to nominate representatives to observe the review process for Track 1 proposals.

Track 1 proposals and relevant information about proposals involving collaboration with Canada or the United Kingdom will be shared with, respectively, NSERC & SSHRC or UKRI according to the respective arrangements with NSF. For these proposals, NSF will also invite suggestions of relevant reviewers from these agencies. Final decisions on reviewers will be made by NSF. The partner agency in Australia, CSIRO, will partner under a model that focuses on post-panel collaboration. Proposals involving collaboration with Australia will be evaluated by NSF alone taking into account the extent of alignment with one or more CSIRO Missions as part of assessment against Broader Impacts. NSF commits to considering Australia-related expertise along with scientific and other expertise in identifying reviewers. If these proposals involve collaboration with Canada and/or the United Kingdom as well, NSF will invite suggestion of appropriate reviewers from the relevant Canadian and/or U.K. agencies.

Track 2 proposal will be reviewed by NSF alone.

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 or the Division of Acquisition and Cooperative Support 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 an NSF Grants and Agreements Officer. 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 https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 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 *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

Administrative and National Policy Requirements

Build America, Buy America

As expressed in Executive Order 14005, Ensuring the Future is Made in All of America by All of America's Workers (86 FR 7475), it is the policy of the executive branch to use terms and conditions of Federal financial assistance awards to maximize, consistent with law, the use of goods, products, and materials produced in, and services offered in, the United States.

Consistent with the requirements of the Build America, Buy America Act (Pub. L. 117-58, Division G, Title IX, Subtitle A, November 15, 2021), no funding made available through this funding opportunity may be obligated for an award unless all iron, steel, manufactured products, and construction materials used in the project are produced in the United States. For additional information, visit NSF's Build America, Buy America webpage.

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 no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 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 Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

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:

- Paul Raterron, OISE, telephone: (703) 292-8565, email: globalcenters@nsf.gov
- Karen R. Lips, OISE, telephone: (703) 292-5133, email: globalcenters@nsf.gov
- Wenda Bauchspies, OISE, telephone: (703) 292-5034, email: globalcenters@nsf.gov
- Hannah Perry, OISE, telephone: (703) 292-7358, email: globalcenters@nsf.gov
- Crystal Leach, ENG, telephone: (703) 292-2667, email: crleach@nsf.gov
- Yulia Gel, MPS, telephone: (703) 292-7888, email: ygel@nsf.gov
- Lina C. Patino, GEO, telephone: (703) 292-5047, email: lpatino@nsf.gov
- Jeremy Koster, SBE, telephone: (703) 292-8740, email: jkoster@nsf.gov
- Elsa Gonzalez, EDU, telephone: (703) 292-4690, email: elgonzal@nsf.gov
- Michael Reksulak, TIP, telephone: (703) 292-8329, email: mreksula@nsf.gov
- Sorin Draghici, telephone: (703) 292-2232, email: sdraghic@nsf.gov
- Clifford Weil, telephone: (703) 292-4668, email: cweil@nsf.gov

For questions related to the use of NSF systems contact:

- NSF Help Desk: 1-800-673-6188
- Research.gov Help Desk e-mail: rgov@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.

For questions related to the use of Research.gov, contact:

Research.gov Help Desk e-mail: rgov@nsf.gov

For inquiries regarding Canadian involvement in this program, contact:

NSERC's Alliance International: RP-Initiatives-PR@nserc-crsng.gc.ca

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.

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 https://www.grants.gov.

Other programs managed by the Office of International Science and Engineering include:

- Partnerships for International Research and Education (PIRE)
- Accelerating Research through International Network-to-Network Collaborations (AccelNet)
- International Research Experiences for Students (IRES)

Related Programs:

Investigators may also wish to view the Programs and Funding Opportunities section of the OISE home page

https://www.nsf.gov/dir/index.jsp?org=OISE to view the lists of OISE Managed Opportunities and other NSF Opportunities that Highlight International Collaboration.

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 (FASED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.F.7 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 https://www.nsf.gov

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

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

  or telephone: (703) 292-8134
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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