

(b) or fails to provide information requested under this section; or

(2) the Chief of Research Security determines the disclosures under this section indicate a threat to research security.

(Pub. L. 117–167, div. B, title III, §10339B, Aug. 9, 2022, 136 Stat. 1556.)

PART E—FUNDAMENTAL RESEARCH

**§ 19051. Broader impacts**

**(a) Assessment**

Not later than 120 days after August 9, 2022, the Director shall enter into an agreement with a qualified independent organization to assess how the Broader Impacts review criterion is applied across the Foundation and make recommendations for improving the effectiveness for meeting the goals established in section 1862p–14 of this title.

**(b) Activities**

The Director shall make awards on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support activities to increase the efficiency, effectiveness, and availability of resources for implementing the Broader Impacts review criterion, including—

(1) training and workshops for program officers, merit review panelists, award office administrators, faculty, and students to improve understanding of the goals and the full range of potential broader impacts available to researchers to satisfy this criterion;

(2) repositories and clearinghouses for sharing best practices and facilitating collaboration; and

(3) tools for evaluating and documenting societal impacts of research.

(Pub. L. 117–167, div. B, title III, §10341, Aug. 9, 2022, 136 Stat. 1557.)

**§ 19052. Research ethics**

**(a) Sense of Congress**

It is the sense of Congress that—

(1) a number of emerging areas of research have potential ethical, social, safety, and security implications that might be apparent as early as the basic research stage;

(2) the incorporation of ethical, social, safety, and security considerations into the research design and review process for Federal awards, may help mitigate potential harms before they happen;

(3) the Foundation’s agreement with the National Academies to conduct a study and make recommendations with respect to governance of research in emerging technologies is a positive step toward accomplishing this goal; and

(4) the Foundation should continue to work with stakeholders to promote best practices for governance of research in emerging technologies at every stage of research.

**(b) Incorporation of ethics considerations**

Drawing on stakeholder input, not later than 24 months after August 9, 2022, the Director shall revise proposal instructions to require that ethical and societal considerations are to be in-

cluded as part of a proposal for funding prior to making the award, where such considerations are applicable. Such considerations shall be evaluated by the Director in the review of proposals, taking into account any relevant input from the peer-reviewers for the proposal, and shall factor into award decisions, as deemed necessary by the Director. When incorporating such considerations, proposers may include, as appropriate—

(1)(A) any readily foreseeable or quantifiable risks to society, including how the research could enable products, technologies, or other outcomes that could intentionally or unintentionally cause significant societal harm; or

(B) an assertion that no readily foreseeable potential ethical, social, safety, or security implications are apparent;

(2) how technical or social solutions can mitigate such risks and, as appropriate, a plan to implement such mitigation measures; and

(3) how partnerships and collaborations in the research can help mitigate potential harm and amplify potential societal benefits.

**(c) Guidance**

The Director shall solicit stakeholder input to develop clear guidance on what constitutes a readily foreseeable or quantifiable risk as described in subsection (b)(1), and to the extent practicable harmonize this policy with existing ethical policies or related requirements for human subjects.

**(d) Research**

The Director shall make awards, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support—

(1) research to assess the potential ethical and societal implications of Foundation-supported research and products or technologies enabled by such research, including the benefits and risks identified pursuant to subsection (b)(1); and

(2) the development and verification of approaches to proactively mitigate foreseeable risks to society, including the technical and social solutions identified pursuant to subsection (b)(1).

**(e) Annual report**

The Director shall encourage recipients to update their consideration of potential risks and benefits as appropriate as part of the annual reports required by all awardees under the award terms and conditions.

(Pub. L. 117–167, div. B, title III, §10343, Aug. 9, 2022, 136 Stat. 1557.)

**§ 19053. Research reproducibility and replicability**

**(a) In general**

Consistent with existing Federal law for privacy, intellectual property, and security, the Director shall facilitate public access to research products, including data, software, and code, developed as part of Foundation-supported projects.

**(b) Data management plans****(1) In general**

The Director shall require that every proposal for funding for research include a machine-readable data management plan that includes a description of how the awardee will archive and preserve public access to data, software, and code developed as part of the proposed project.

**(2) Requirements**

In carrying out the requirement in paragraph (1), the Director shall—

(A) provide necessary resources, including trainings and workshops, to educate researchers and students on how to develop and review high quality data management plans;

(B) ensure program officers and merit review panels are equipped with the resources and training necessary to review the quality of data management plans; and

(C) ensure program officers and merit review panels treat data management plans as essential elements of award proposals, where appropriate.

**(c) Open repositories**

The Director shall—

(1) consult with the heads of other Federal research agencies, as appropriate, and solicit input from the scientific community, to develop and widely disseminate a set of criteria for trusted open repositories to be used by Foundation-funded researchers, accounting for discipline-specific needs and necessary protections for sensitive information;

(2) work with stakeholders to identify significant gaps in available repositories meeting the criteria developed under paragraph (1) and options for supporting the development of additional or enhanced repositories;

(3) make awards on a competitive basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) for the development, upgrades, and maintenance of open data repositories that meet the criteria developed under paragraph (1);

(4) work with stakeholders and build on existing models, where appropriate, to establish a single, public, web-based point of access to help users locate repositories storing data, software, and code resulting from or used in Foundation-supported projects;

(5) work with stakeholders to establish the necessary policies and procedures and allocate the necessary resources to ensure, as practicable, data underlying published findings resulting from Foundation-supported projects are deposited in repositories meeting the criteria developed under paragraph (1) at the time of publication;

(6) incentivize the deposition of data, software, and code into repositories that meet the criteria developed under paragraph (1); and

(7) coordinate with the scientific publishing community and the heads of other relevant Federal departments and agencies to support the development of voluntary consensus standards around data archiving and sharing.

**(d) Research, development, and education**

The Director shall make awards, on a competitive basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to—

(1) support research and development of open source, sustainable, usable tools and infrastructure that support reproducibility for a broad range of studies across different disciplines;

(2) support research on computational reproducibility, including the limits of reproducibility and the consistency of computational results in the development of new computational hardware, tools, and methods; and

(3) support the education and training of students, faculty, and researchers on computational methods, tools, and techniques to improve the quality and sharing of data, code, and supporting metadata to produce reproducible research.

(Pub. L. 117-167, div. B, title III, §10344, Aug. 9, 2022, 136 Stat. 1558.)

**§ 19054. Climate change research**

The Director shall make awards, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support research to improve our understanding of the climate system and related human and environmental systems.

(Pub. L. 117-167, div. B, title III, §10345, Aug. 9, 2022, 136 Stat. 1560.)

**§ 19055. Social, behavioral, and economic sciences**

The Director shall—

(1) actively communicate opportunities and solicit proposals for social, behavioral, and economic science researchers to participate in cross-cutting and interdisciplinary programs, including the Convergence Accelerator and agency priority activities, and the Mid-Scale Research Infrastructure program; and

(2) ensure social, behavioral, and economic science researchers are represented on relevant merit review panels for such activities.

(Pub. L. 117-167, div. B, title III, §10346, Aug. 9, 2022, 136 Stat. 1560.)

**§ 19056. Measuring impacts of Federally funded research and development**

The Director shall make awards on a competitive, merit-reviewed basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support research and development of data, models, indicators, and associated analytical tools to improve our understanding of the impacts of Federally funded research on society, the economy, and the workforce, including domestic job creation.

(Pub. L. 117-167, div. B, title III, §10347, Aug. 9, 2022, 136 Stat. 1560.)

**§ 19057. Food-energy-water research**

The Director shall make awards on a competitive basis to institutions of higher education or