

110TH CONGRESS
1ST SESSION

S. 2307

To amend the Global Change Research Act of 1990, and for other purposes.

IN THE SENATE OF THE UNITED STATES

NOVEMBER 5, 2007

Mr. KERRY (for himself and Mrs. SNOWE) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

A BILL

To amend the Global Change Research Act of 1990, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Global Change Re-
5 search Improvement Act of 2007”.

6 **SEC. 2. TABLE OF CONTENTS.**

7 The table of contents for this Act is as follows:

TITLE I—AMENDMENT OF THE GLOBAL CHANGE RESEARCH ACT
OF 1990

Sec. 101. Amendment of Global Change Research Act of 1990.

Sec. 102. Changes to findings and purpose.

Sec. 103. Changes in definitions.

- Sec. 104. Change in committee name and structure.
- Sec. 105. Change in National Global Change Research Plan.
- Sec. 106. Integrated Program Office.
- Sec. 107. Budget coordination.
- Sec. 108. Research grants.
- Sec. 109. Evaluation of information.
- Sec. 110. Repeal of obsolete provision.
- Sec. 111. Ice sheet study and report.
- Sec. 112. Hurricane frequency and intensity study and report.
- Sec. 113. Scientific communications.
- Sec. 114. Aging workforce issues program.
- Sec. 115. Authorization of appropriations.

TITLE II—NATIONAL CLIMATE SERVICE

- Sec. 201. Amendment of National Climate Program Act.

TITLE III—TECHNOLOGY ASSESSMENT

- Sec. 301. National Science and Technology Assessment Service.

TITLE IV—CLIMATE CHANGE TECHNOLOGY

- Sec. 401. NIST greenhouse gas functions.
- Sec. 402. Development of new measurement technologies.
- Sec. 403. Enhanced environmental measurements and standards.
- Sec. 404. Technology development and diffusion.
- Sec. 405. Authorization of appropriations.

TITLE V—ABRUPT CLIMATE CHANGE

- Sec. 501. Abrupt climate change research program.
- Sec. 502. Purposes of program.
- Sec. 503. Abrupt climate change defined.
- Sec. 504. Authorization of appropriations.

1 **TITLE I—AMENDMENT OF THE**
 2 **GLOBAL CHANGE RESEARCH**
 3 **ACT OF 1990**

4 **SEC. 101. AMENDMENT OF GLOBAL CHANGE RESEARCH**
 5 **ACT OF 1990.**

6 Except as otherwise expressly provided, whenever in
 7 this title an amendment or repeal is expressed in terms
 8 of an amendment to, or repeal of, a section or other provi-
 9 sion, the reference shall be considered to be made to a

1 section or other provision of the Global Change Research
2 Act of 1990 (15 U.S.C. 2921 et seq.).

3 **SEC. 102. CHANGES TO FINDINGS AND PURPOSE.**

4 Section 101 (15 U.S.C. 2931) is amended to read as
5 follows:

6 **“SEC. 101. FINDINGS AND PURPOSE.**

7 “(a) FINDINGS.—The Congress makes the following
8 findings:

9 “(1) According to the 4th Assessment Report of
10 the Intergovernmental Panel on Climate Change,
11 most of the observed increase in global average tem-
12 peratures since the mid-20th century is very likely
13 due to the observed increase in anthropogenic green-
14 house gas concentrations.

15 “(2) Human-induced changes, in conjunction
16 with natural fluctuations, may lead to significant al-
17 terations of world climate patterns. Over this cen-
18 tury, these changes could adversely affect world ag-
19 ricultural and marine production, coastal habit-
20 ability, biological diversity, human health, global so-
21 cial and political stability, and global economic activ-
22 ity.

23 “(3) Developments in interdisciplinary Earth
24 sciences, global observing systems, and satellite and
25 computing technologies make possible significant sci-

1 entific understanding and prediction of global
2 changes and their effects, and have resulted in the
3 significant expansion of environmental data and in-
4 formation.

5 “(4) Development and strengthening of effec-
6 tive policies to mitigate and adapt to global change
7 will rely on improvement in scientific understanding
8 of global environmental and societal processes and
9 on development of information that is of use to deci-
10 sionmakers at the local, regional, and national levels.

11 “(5) Although significant Federal global change
12 research efforts are underway, an effective Federal
13 program will require improvements in interagency
14 coordination, coordination with the activities of local,
15 regional, State, private, and international entities,
16 and increased levels of Federal resources.

17 “(6) Although the United States Global Change
18 Research Program has made significant contribu-
19 tions to understanding Earth’s climate and the an-
20 thropogenic influences on Earth’s climate and its
21 ecosystems, the Program also needs to produce in-
22 formation that better meets the expressed needs of
23 decisionmakers.

24 “(7) Better predictions of future climate condi-
25 tions at the regional level are desirable to inform de-

1 cisions, including those related to land, water, and
2 resource management.

3 “(8) Improved understanding of global change
4 is needed to identify risks and vulnerabilities under
5 plausible climate futures to assist decisionmakers in
6 the development of policies to help ensure that eco-
7 logical, social, and economic systems are resilient.

8 “(9) In order to more effectively meet the needs
9 of decisionmakers and the public, the research agen-
10 da of the United States Global Change Research
11 Program and its implementation and products
12 should be informed by continuous feedback from
13 users of information generated by the Program.

14 “(b) PURPOSE.—The purpose of this title is to pro-
15 vide for the continuation and coordination of a comprehen-
16 sive and integrated United States observation, research,
17 assessment, and outreach program which will assist the
18 Nation and the world to better understand, assess, predict,
19 mitigate, and adapt to the effects of human-induced and
20 natural processes of global change.”.

21 **SEC. 103. CHANGES IN DEFINITIONS.**

22 Section 2 (15 U.S.C. 2921) is amended—

23 (1) by redesignating paragraphs (1) through
24 (6) as paragraphs (2) through (7), respectively;

1 (2) by inserting before paragraph (2), as redesi-
2 gnated, the following:

3 “(1) ‘climate change’ means any change in cli-
4 mate over time, whether due to natural variability or
5 as a result of human activity;”;

6 (3) by striking “Earth and Environmental
7 Sciences” in paragraph (2), as redesignated and in-
8 serting “Global Change Research”; and

9 (4) by striking paragraph (4), as redesignated,
10 and inserting the following:

11 “(4) ‘global change’ means human-induced or
12 natural changes in the global environment (including
13 climate change and other phenomena affecting land
14 productivity, oceans and coastal areas, freshwater
15 resources, atmospheric chemistry, biodiversity, and
16 ecological systems) that may alter the capacity of
17 Earth to sustain life;”.

18 **SEC. 104. CHANGE IN COMMITTEE NAME AND STRUCTURE.**

19 Section 102 (15 U.S.C. 2932) is amended—

20 (1) by striking “**EARTH AND ENVIRON-**
21 **MENTAL SCIENCES.**” in the section heading and
22 inserting “**GLOBAL CHANGE RESEARCH.**”;

23 (2) by striking “Earth and Environmental
24 Sciences.” in subsection (a) and inserting “Global
25 Change Research.”;

1 (3) by redesignating paragraphs (14) and (15)
2 of subsection (b) as paragraphs (15) and (16), re-
3 spectively, and inserting after paragraph (13) the
4 following:

5 “(14) the National Institute of Standards and
6 Technology of the Department of Commerce;”;

7 (4) by striking the last sentence of subsection
8 (b) and inserting “The representatives shall be the
9 Deputy Secretary or the Deputy Secretary’s des-
10 ignee (or, in the case of an agency other than a de-
11 partment, the deputy head of that agency or the
12 deputy’s designee).”;

13 (5) by striking subsection (d) and inserting the
14 following:

15 “(d) SUBCOMMITTEES AND WORKING GROUPS.—The
16 Committee may establish such additional subcommittees
17 and working groups to carry out its work as it sees fit.”;
18 and

19 (6) by striking “and” after the semicolon in
20 subsection (e)(6); and

21 (7) by redesignating paragraph (7) of sub-
22 section (e) as paragraph (8) and inserting after
23 paragraph (6) the following:

24 “(7) work with appropriate Federal, State, re-
25 gional, and local authorities to ensure that the Pro-

1 gram is designed to produce information needed to
2 develop policies to reduce the impacts of global
3 change; and”.

4 **SEC. 105. CHANGE IN NATIONAL GLOBAL CHANGE RE-**
5 **SEARCH PLAN.**

6 Section 104 (15 U.S.C. 2934) is amended—

7 (1) by striking the section heading and insert-
8 ing the following:

9 **“SEC. 104. NATIONAL GLOBAL CHANGE RESEARCH AND AS-**
10 **SESSMENT PLAN.” ;**

11 (2) by redesignating subsections (a) through (f)
12 as subsections (b) through (g), respectively, and in-
13 serting before subsection (b), as redesignated, the
14 following:

15 **“(a) STRATEGIC PLAN; REVISED IMPLEMENTATION**
16 **PLAN.—**The Chairman of the Council, through the Com-
17 mittee, shall develop a strategic plan for the United States
18 Global Climate Change Research Program for the 10-year
19 period beginning in 2008 and submit the plan to the Con-
20 gress within 1 year after the date of enactment of the
21 Global Change Research Improvement Act of 2007. The
22 strategic plan shall include a detailed plan for research,
23 assessment, information management, public participa-
24 tion, outreach, and budget.”;

1 (3) by inserting “and Assessment” after “Re-
2 search” in subsection (b), as redesignated;

3 (4) by striking “research.” in subsection (b), as
4 redesignated, and inserting “research and assess-
5 ment.”;

6 (5) by striking “this title,” in subsection (b), as
7 redesignated, and inserting “the Global Change Re-
8 search Improvement Act of 2007.”;

9 (6) by inserting “short-term and long-term” be-
10 fore “goals” in paragraph (1) of subsection (c), as
11 redesignated;

12 (7) by striking “usable information on which to
13 base policy decisions related to” in paragraph (1) of
14 subsection (c), as redesignated, and inserting “infor-
15 mation relevant and readily usable by local, State,
16 and Federal decisionmakers, as well as other end-
17 users, for the formulation of effective decisions and
18 strategies for measuring, predicting, mitigating, and
19 adapting to”;

20 (8) by inserting “development of regional sce-
21 narios, assessment of model predictability, assess-
22 ment of climate change impacts,” after “predictive
23 modeling,” in paragraph (2) of subsection (c), as re-
24 designated;

1 (9) by striking “priorities;” in paragraph (2) of
2 subsection (c), as redesignated, and inserting “prior-
3 ities and propose measures to address gaps and
4 growing needs for these activities;”

5 (10) by striking paragraphs (6) and (7) of sub-
6 section (c), as redesignated, and inserting the fol-
7 lowing:

8 “(6) make recommendations for the coordina-
9 tion of the global change research and assessment
10 activities of the United States with such activities of
11 other Nations and international organizations, in-
12 cluding—

13 “(A) a description of the extent and nature
14 of international cooperative activities;

15 “(B) bilateral and multilateral efforts to
16 provide worldwide access to scientific data and
17 information, and proposals to improve such ac-
18 cess and build capacity for its use; and

19 “(C) improving participation by developing
20 Nations in international global change research
21 and environmental data collection;

22 “(7) detail budget requirements for Federal
23 global change research and assessment activities to
24 be conducted under the Plan;

1 “(8) include a process for identifying informa-
2 tion needed by appropriate Federal, State, regional,
3 and local decisionmakers to develop policies to plan
4 for and address projected impacts of global change;

5 “(9) identify and sustain the observing systems
6 currently employed in collecting data relevant to
7 global and regional climate change research and
8 prioritize additional observation systems that may be
9 needed to ensure adequate data collection and moni-
10 toring of global change;

11 “(10) identify existing capabilities and gaps in
12 national, regional, and local climate prediction and
13 scenario-based modeling capabilities for forecasting
14 and projecting climate impacts at local and regional
15 levels, and propose measures to address such gaps;

16 “(11) describe specific activities designed to fa-
17 cilitate outreach and data and information exchange
18 with regional, State, and local governments and
19 other user communities;

20 “(12) identify and describe ecosystems and geo-
21 graphic regions of the United States that are likely
22 to experience similar impacts of global change or are
23 likely to share similar vulnerabilities to global
24 change; and

1 “(13) include such additional matter as the
2 Committee deems appropriate.”;

3 (11) by striking paragraphs (1) and (2) of sub-
4 section (d), as redesignated, and inserting the fol-
5 lowing:

6 “(1) Global and regional research and measure-
7 ments to understand the nature of and interaction
8 among physical, chemical, biological, land use, and
9 social processes responsible for changes in the Earth
10 system on all relevant spatial and time scales.

11 “(2) Development of indicators, baseline data-
12 bases, and ongoing monitoring to document global
13 change, including changes in species distribution and
14 behavior, changes in oceanic and atmospheric chem-
15 istry, extent of ice sheets, glaciers, and snow cover,
16 shifts in water distribution and abundance, and
17 changes in sea level.”;

18 (12) by adding at the end of subsection (d), as
19 redesignated, the following:

20 “(6) Methods for integrating information to
21 provide predictive and other tools for planning and
22 decisionmaking by governments, communities and
23 the private sector.”;

24 (13) by striking “and” in paragraph (2) of sub-
25 section (e), as redesignated;

1 (14) by striking paragraph (3) of subsection
2 (e), as redesignated, and inserting the following:

3 “(3) combine and interpret data from various
4 sources to produce information readily usable by
5 local, State, and Federal policymakers, and other
6 end-users, attempting to formulate effective deci-
7 sions and strategies for mitigating and adapting to
8 the effects of global change; and”;

9 (15) by adding at the end of subsection (e), as
10 redesignated, the following:

11 “(4) establish a common assessment and mod-
12 eling framework that may be used in both research
13 and operations to project, predict, and assess the
14 vulnerability of natural and managed ecosystems
15 and of human society in the context of other envi-
16 ronmental and social changes.”; and

17 (16) by striking “change research.” in para-
18 graph (2) of subsection (f), as redesignated, and in-
19 serting “and regional climate research and assess-
20 ment.”.

21 **SEC. 106. INTEGRATED PROGRAM OFFICE.**

22 Section 105 (15 U.S.C. 2935) is amended—

23 (1) by redesignating subsections (a), (b), and
24 (c) as subsections (b), (c), and (d), respectively; and

1 (2) by inserting before subsection (b), as redesi-
2 gnated, the following:

3 “(a) INTEGRATED PROGRAM OFFICE.—

4 “(1) ESTABLISHMENT.—There is established in
5 the Office of Science and Technology Policy an Inte-
6 grated Program Office for the Program.

7 “(2) ORGANIZATION.—The Integrated Program
8 Office established under paragraph (1) shall be
9 headed by the associate director with responsibility
10 for climate change science and technology and shall
11 include, to the maximum extent feasible, a rep-
12 resentative from each Federal agency participating
13 in the Program.

14 “(3) FUNCTION.—The Integrated Program Of-
15 fice shall—

16 “(A) manage, in conjunction with the
17 Committee, interagency coordination and pro-
18 gram integration of global change research ac-
19 tivities and budget requests;

20 “(B) ensure that the activities and pro-
21 grams of each Federal agency or department
22 participating in the Program address the goals
23 and objectives identified in the strategic re-
24 search plan and interagency implementation
25 plans;

1 “(C) ensure program and budget rec-
2 ommendations of the Committee are commu-
3 nicated to the President and are integrated into
4 the strategic and implementation plans for the
5 Program;

6 “(D) review, solicit, identify, and arrange
7 funding for partnership projects that address
8 critical research objectives or operational goals
9 of the Program, including projects that would
10 fill research gaps identified by the Program,
11 and for which project resources are shared
12 among at least 2 agencies participating in the
13 Program; and

14 “(E) review and provide recommendations,
15 in conjunction with the Committee, on all an-
16 nual appropriations requests from Federal
17 agencies or departments participating in the
18 Program.”;

19 (3) by striking “Committee.” in paragraph (2)
20 of subsection (c), as redesignated, and inserting
21 “Committee and the Integrated Program Office.”;
22 and

23 (4) by inserting “and the Integrated Program
24 Office” after “Committee” in paragraph (1) of sub-
25 section (d), as redesignated.

1 **SEC. 107. BUDGET COORDINATION.**

2 Section 105 (15 U.S.C. 2935), as amended by section
3 106, is further amended by striking subsection (d), as re-
4 designated, and inserting the following:

5 “(d) CONSIDERATION IN PRESIDENT’S BUDGET.—

6 “(1) IN GENERAL.—Before each annual budget
7 submitted to the Congress under section 1105 of
8 title 31, United States Code, the President shall, in
9 a timely fashion, provide an opportunity to the Com-
10 mittee and the Integrated Program Office to review
11 and comment on the budget estimate of each agency
12 and department involved in global change research
13 in the context of the Plan.

14 “(2) PROGRAM ITEMS.—The President shall
15 submit, at the time of the annual budget request to
16 Congress, an integrated budget plan that would con-
17 solidate and highlight Program priorities and include
18 a description of those items in each agency’s annual
19 budget which are elements of the Program.”.

20 **SEC. 108. RESEARCH GRANTS.**

21 Section 105 (15 U.S.C. 2935), as amended by sec-
22 tions 106 and 107, is further amended—

23 (1) by redesignating subsections (b), (c), (d),
24 and (e) as subsections (c), (d), (e), and (f), respec-
25 tively; and

1 (2) by inserting after subsection (a) the fol-
2 lowing:

3 “(b) RESEARCH GRANTS.—

4 “(1) COMMITTEE TO DEVELOP LIST OF PRI-
5 ORITY RESEARCH AREAS.—The Committee shall de-
6 velop a list of priority areas for research and devel-
7 opment on climate change that are not being ade-
8 quately addressed by Federal agencies.

9 “(2) DIRECTOR OF OSTP TO TRANSMIT LIST TO
10 NSF.—The Director of the Office of Science and
11 Technology Policy shall transmit the list to the Na-
12 tional Science Foundation.

13 “(3) FUNDING THROUGH NSF.—

14 “(A) BUDGET REQUEST.—The National
15 Science Foundation shall include, as part of the
16 annual request for appropriations for the
17 Science and Technology Policy Institute, a re-
18 quest for appropriations to fund research in the
19 priority areas on the list developed under para-
20 graph (1).

21 “(B) AUTHORIZATION.—For fiscal year
22 2008 and each fiscal year thereafter, there are
23 authorized to be appropriated to the National
24 Science Foundation not less than \$30,000,000,
25 to be made available through the Science and

1 Technology Policy Institute, for research in
2 those priority areas.”.

3 **SEC. 109. EVALUATION OF INFORMATION.**

4 Section 106 (15 U.S.C. 2936) is amended—

5 (1) by striking “**SCIENTIFIC**” in the section
6 heading;

7 (2) by striking “On a periodic basis (not less
8 frequently than every 4 years), the Council, through
9 the Committee, shall prepare and submit to the
10 President and the Congress an assessment” and in-
11 serting “On a periodic basis (not less frequently
12 than every 4 years), the President shall submit to
13 Congress a single, integrated, comprehensive assess-
14 ment”;

15 (3) by striking “and” after the semicolon in
16 paragraph (2); and

17 (4) by striking “years.” in paragraph (3) and
18 inserting “years; and”;

19 (5) by adding at the end the following:

20 “(4) evaluates the information being developed
21 under this title, considering in particular its useful-
22 ness to local, State, and national decisionmakers, as
23 well as to other stakeholders such as the private sec-
24 tor, after providing a meaningful opportunity for the
25 consideration of the views of such stakeholders on

1 the effectiveness of the Program and the usefulness
2 of the information.”.

3 **SEC. 110. REPEAL OF OBSOLETE PROVISION.**

4 Section 108 (15 U.S.C. 2938) is amended by striking
5 subsection (c).

6 **SEC. 111. ICE SHEET STUDY AND REPORT.**

7 (a) STUDY.—

8 (1) REQUIREMENT.—The Director of the Na-
9 tional Science Foundation and the Administrator of
10 National Oceanic and Atmospheric Administration
11 shall enter into an arrangement with the National
12 Academy of Sciences to complete a study of the cur-
13 rent status of ice sheet melt and movement, as
14 caused by climate change, with implications for glob-
15 al sea level rise.

16 (2) CONTENTS.—The study shall take into con-
17 sideration—

18 (A) the past research completed related to
19 ice sheet melt as reviewed by Working Group I
20 of the Intergovernmental Panel on Climate
21 Change;

22 (B) additional research published since the
23 fall of 2005 that was not included in the Work-
24 ing Group I report due to time constraints; and

1 (C) the need for an accurate assessment of
2 changes in ice sheet spreading, changes in ice
3 sheet flow, self-lubrication, the corresponding
4 effect on ice sheets, and current modeling capa-
5 bilities.

6 (3) REPORT.—Not later than 18 months after
7 the date of enactment of this Act, the National
8 Academy of Sciences shall transmit to the Com-
9 mittee on Science and Technology of the House of
10 Representatives and the Committee on Commerce,
11 Science, and Transportation of the Senate a report
12 on the key findings of the study conducted under
13 subsection (a), along with recommendations for addi-
14 tional research related to ice sheet melt and cor-
15 responding sea level rise.

16 **SEC. 112. HURRICANE FREQUENCY AND INTENSITY STUDY**
17 **AND REPORT.**

18 (a) STUDY.—

19 (1) REQUIREMENT.—The Administrator of the
20 National Oceanic and Atmospheric Administration
21 and the Director of the National Science Foundation
22 shall enter into an arrangement with the National
23 Academy of Sciences to complete a study of the cur-
24 rent state of the science on the potential impacts of
25 climate change on patterns of tropical cyclone (hur-

1 ricane and typhoon) development, including storm
2 intensity, track, and frequency, overall destructive
3 power, precipitation amount and intensity, runoff
4 and flooding, and the implications for hurricane-
5 prone and typhoon-prone coastal regions.

6 (2) CONTENTS.—The study shall take into con-
7 sideration—

8 (A) the past research completed related to
9 hurricane and typhoon development, track, and
10 intensity as reviewed by Working Groups I and
11 II of the Intergovernmental Panel on Climate
12 Change;

13 (B) additional research completed since the
14 fall of 2005 that was not included in the Work-
15 ing Group I and II reports due to time con-
16 straints;

17 (C) the need for accurate assessment of
18 potential changes in hurricane and typhoon in-
19 tensity, track, and frequency and of the current
20 modeling and forecasting capabilities and the
21 need for improvements in forecasting of these
22 parameters; and

23 (D) the need for additional research, real-
24 time observation, and monitoring to improve
25 forecasting of hurricanes and typhoons and to

1 understand the relationship between climate
2 change and hurricane and typhoon develop-
3 ment.

4 (3) REPORT.—Not later than 18 months after
5 the date of enactment of this Act, the National
6 Academy of Sciences shall transmit to the Com-
7 mittee on Science and Technology of the House of
8 Representatives and the Committee on Commerce,
9 Science, and Transportation of the Senate a report
10 on the key findings of the study conducted under
11 subsection (a).

12 **SEC. 113. SCIENTIFIC COMMUNICATIONS.**

13 The President shall establish guidelines and imple-
14 ment a plan that requires the National Oceanic and At-
15 mospheric Administration, the National Aeronautics and
16 Space Administration, the Environmental Protection
17 Agency, the National Science Foundation, and other Fed-
18 eral agencies with scientific research programs to adopt
19 policies that ensure the integrity of scientific communica-
20 tions. Such policies shall include provisions that ensure
21 that final text and communications are approved by the
22 scientist or scientists who authored the report or commu-
23 nication, and that enable scientists to disseminate research
24 results and freely communicate with the Congress, the
25 media, and colleagues in a timely fashion.

1 **SEC. 114. AGING WORKFORCE ISSUES PROGRAM.**

2 The Administrator of the National Oceanic and At-
3 mospheric Administration shall implement a program to
4 address aging work force issues in climate science, global
5 change, and other focuses of NOAA research that—

6 (1) documents technical and management expe-
7 riences before senior employees leave the Adminis-
8 tration, including—

9 (A) documenting lessons learned;

10 (B) briefing organizations;

11 (C) providing opportunities for archiving
12 lessons in a database; and

13 (D) providing opportunities for near-term
14 retirees to transition out early from their pri-
15 mary assignment in order to document their ca-
16 reer lessons learned and brief new employees
17 prior to their separation from the Administra-
18 tion;

19 (2) provides incentives for retirees to return
20 and teach new employees about their career lessons
21 and experiences; and

22 (3) provides for the development of an award to
23 recognize and reward outstanding senior employees
24 for their contributions to knowledge sharing.

1 **SEC. 115. AUTHORIZATION OF APPROPRIATIONS.**

2 There are authorized to be appropriated for the pur-
3 poses of carrying out this Act such sums as may be nec-
4 essary for fiscal years 2008 through 2012. Of the amounts
5 appropriated for that fiscal year period—

6 (1) \$4,000,000 shall be made available to the
7 Office of Science and Technology Policy for each of
8 such fiscal years; and

9 (2) such sums as may be necessary shall be
10 made available to—

11 (A) the National Oceanic and Atmospheric
12 Administration for each of such fiscal years;

13 (B) the National Science Foundation for
14 each of such fiscal years;

15 (C) the National Aeronautics and Space
16 Administration for each of such fiscal years;
17 and

18 (D) other Federal agencies participating in
19 the Program, to the extent funds remain avail-
20 able after the application of paragraph (1) and
21 subparagraphs (A), (B), and (C) of this para-
22 graph, for each of such fiscal years.

1 **TITLE II—NATIONAL CLIMATE**
2 **SERVICE**

3 **SEC. 201. AMENDMENT OF NATIONAL CLIMATE PROGRAM**
4 **ACT.**

5 The National Climate Program Act (15 U.S.C. 2901
6 et seq.) is amended to read as follows:

7 **“SECTION 1. SHORT TITLE; TABLE OF CONTENTS.**

8 “(a) **SHORT TITLE.**—This Act may be cited as the
9 “National Climate Service Act of 2007”.

10 “(b) **TABLE OF CONTENTS.**—The table of contents
11 for this Act is as follows:

“Sec. 1. Short title; table of contents.

“Sec. 2. Findings.

“Sec. 3. Purpose.

“Sec. 4. National Climate Service.

“Sec. 5. Contract and grant authority.

“Sec. 6. Annual report.

“Sec. 7. Definitions.

“Sec. 8. Authorization of appropriations.

12 **“SEC. 2. FINDINGS.**

13 “The Congress finds the following:

14 “(1) Weather, climate change, and climate vari-
15 ability affect public safety, environmental services
16 and security, human health, agriculture, energy use,
17 water resources, and other factors vital to national
18 security and human welfare.

19 “(2) The present rate of advance of national ef-
20 forts in research and development and the applica-
21 tion of such advances is inadequate to meet the chal-

1 lenges posed by observed and projected rates of cli-
2 mate change and climate variability and the increas-
3 ing demand for information to guide planning and
4 response across all sectors.

5 “(3) The United States lacks adequate re-
6 search, infrastructure, and coordinated outreach and
7 communication mechanisms to meet national climate
8 monitoring, prediction, and decision support needs
9 for adapting to and mitigating the impacts of cli-
10 mate change and climate variability.

11 “(4) Information regarding climate change and
12 climate variability is not being fully disseminated or
13 used, and Federal efforts have given insufficient at-
14 tention to assessing and applying this information.

15 “(5) Climate change and climate variability
16 occur on a global basis making international co-
17 operation essential for the purpose of sharing the
18 benefits and costs of a global effort to understand
19 and communicate these changes.

20 **“SEC. 3. PURPOSE.**

21 “‘It is the purpose of this Act to establish a National
22 Climate Service that will advance the national interest and
23 associated international concerns in understanding, fore-
24 casting, responding, adapting to, and mitigating the im-

1 pacts of natural and human-induced climate change and
2 climate variability.

3 **“SEC. 4. NATIONAL CLIMATE SERVICE.**

4 “(a) ESTABLISHMENT.—The Secretary shall estab-
5 lish within the National Oceanic and Atmospheric Admin-
6 istration a National Climate Service not later than a year
7 after the date of the enactment of the Global Change Re-
8 search Improvement Act of 2007. The Service shall in-
9 clude a national center and a network of regional and local
10 facilities for operational climate monitoring and pre-
11 diction.

12 “(1) IN GENERAL.—The Service shall produce
13 and deliver authoritative, timely and usable informa-
14 tion about climate change, climate variability,
15 trends, and impacts on local, State, regional, na-
16 tional, and global scales.

17 “(2) SPECIFIC SERVICES.—The Service, at a
18 minimum, shall—

19 “(A) provide comprehensive and authoritative
20 information about the state of the climate and its ef-
21 fects, through observations, monitoring, data, infor-
22 mation, and products that accurately reflect climate
23 trends and conditions;

1 “(B) provide predictions and projections on the
2 future state of the climate in support of adaptation,
3 preparedness, attribution, and mitigation;

4 “(C) utilize appropriate research from the
5 United States Global Change Research Program ac-
6 tivities and conduct focused research, as needed, to
7 enhance understanding, information and predictions
8 of the current and future state of the climate and
9 its impacts that is relevant to policy, planning, and
10 decision making;

11 “(D) utilize assessments from the Global
12 Change Research Program activities and conduct fo-
13 cused assessments as needed to enhance under-
14 standing of the impacts of climate change and cli-
15 mate variability;

16 “(E) assess and strengthen delivery mecha-
17 nisms for providing climate information to end
18 users;

19 “(F) communicate climate data, conditions, pre-
20 dictions, projections, indicators, and risks on an on-
21 going basis to decision- and policy- makers, the pri-
22 vate sector, and to the public;

23 “(G) coordinate and collaborate on climate
24 change, climate variability, and impacts activities
25 with municipal, state, regional, national and inter-

1 national agencies and organizations, as appropriate;
2 and

3 “(H) support the Department of State and
4 international agencies and organizations, as well as
5 domestic agencies and organizations, involved in as-
6 sessing and responding to climate change and cli-
7 mate variability.

8 “(b) ACTION PLAN.—Within 1 year after the date of
9 enactment of the Global Change Research Improvement
10 Act of 2007, the Secretary shall submit to the Senate
11 Committee on Commerce, Science, and Transportation
12 and the House Committee on Science and Technology a
13 plan of action for the National Climate Service. The plan,
14 at a minimum, shall—

15 “(1) provide for the interpretation and commu-
16 nication of climate data, conditions, predictions, pro-
17 jections, and risks on an on-going basis to decision
18 and policy makers at the local, regional, and na-
19 tional levels;

20 “(2) design, deploy, and operate an adequate
21 national climate observing system that closes gaps in
22 existing coverage;

23 “(3) support infrastructure and ability to ar-
24 chive and quality ensure climate data, and make fed-
25 erally-funded model simulations and other relevant

1 climate information available from the Global
2 Change Research Program activities and other
3 sources (and related data from paleoclimate studies).

4 “(4) include a program for long-term steward-
5 ship, quality control, development of relevant climate
6 products, and efficient access to all relevant climate
7 data, products, and model simulations;

8 “(5) establish a national coordinated modeling
9 strategy, including a national climate modeling cen-
10 ter to provide a dedicated capability for modeling
11 and forecasting, scenarios and planning resources,
12 and a regular schedule of projections on long- and
13 short-term time horizons over a range of scales, in-
14 cluding regional scales;

15 “(6) improve integrated modeling, assessment,
16 and predictive capabilities needed to document and
17 predict climate changes and impacts, and to guide
18 national, regional, and local planning and decision
19 making;

20 “(7) provide a system of regular consultation
21 and coordination with Federal agencies, States,
22 Tribes, non-governmental organizations, the private
23 sector and the academic community to ensure—

24 “(A) that the information requirements of
25 these groups are well incorporated; and

1 “(B) timely and full sharing, dissemination
2 and use of climate information and services in
3 risk preparedness, planning, decision making,
4 and early warning and natural resources man-
5 agement, both domestically and internationally;

6 “(8) develop standards, evaluation criteria and
7 performance objectives to ensure that the Service
8 meets the evolving information needs of the public,
9 policy makers and decision makers in the face of a
10 changing climate;

11 “(9) develop funding estimates to implement
12 the plan; and

13 “(10) support competitive research programs
14 that will improve elements of the Service described
15 in this Act through the Climate Program Office
16 within the Service headquarter function.

17 “(c) COORDINATION WITH THE USGCRP.—The
18 Service shall utilize appropriate research from Global
19 Change Research Program activities to enhance under-
20 standing, information and predictions of the current and
21 future state of the climate and its impacts that is relevant
22 to policy and decisions. The Service shall provide appro-
23 priate information about the current and future state of
24 the climate and its impacts that are useful for research
25 purposes to relevant Global Change Research Program ac-

1 tivities. The Director of the Service will serve as a liaison
2 to the Global Change Research Program and a member
3 of the Global Change Research Program should serve on
4 the Advisory Council.

5 “(d) DIRECTOR.—The Administrator shall appoint a
6 director of the Service, who shall oversee all processes as-
7 sociated with managing the organization and executing the
8 functions and actions described in this Title. The Director
9 will serve as a liaison to the Global Change Research Pro-
10 gram to ensure the transition of research into services and
11 to provide services to meet the needs of research.

12 “(e) NATIONAL CLIMATE SERVICE ADVISORY COUN-
13 CIL.—The Administrator shall, in consultation with the
14 majority and minority leaders of the Senate Committee
15 on Commerce, Science, and Transportation and the House
16 of Representatives Committee on Science and Technology,
17 and the National Academy of Sciences, appoint the mem-
18 bership of a National Climate Service Advisory Council,
19 with members serving 4-year terms and include a diverse
20 membership from appropriate Federal, State and local
21 government, universities, non-government and private sec-
22 tors who use climate information and cover a range of sec-
23 tors, such as water, drought, fisheries, coasts, agriculture,
24 health, natural resources, transportation, and insurance.
25 The Council shall advise the Director of the Service of key

1 priorities in climate-related issues that require the atten-
2 tion of the Service. The Council shall be responsible for
3 ensuring coordination across regional and national con-
4 cerns and the assessment of evolving information needs.

5 **“SEC. 5. CONTRACT AND GRANT AUTHORITY.**

6 “Functions vested in any Federal officer or agency
7 by this Act or under the Program may be exercised
8 through the facilities and personnel of the agency involved
9 or, to the extent provided or approved in advance in appro-
10 priation Acts, by other persons or entities under contracts
11 or grant arrangements entered into by such officer or
12 agency.

13 **“SEC. 6. ANNUAL REPORT.**

14 “The Secretary shall prepare and submit to the
15 President and the authorizing committees of the Congress,
16 not later than March 31 of each year, a report on the
17 activities conducted pursuant to this Act during the pre-
18 ceding fiscal year, including—

19 “(1) a summary of the achievements of the Na-
20 tional Climate Service during the previous fiscal
21 year; and

22 “(2) an analysis of the progress made toward
23 achieving the goals and objectives of the Service.

24 **“SEC. 7. DEFINITIONS.**

25 “In this Act:

1 “(1) ADMINISTRATOR.—The term ‘Adminis-
2 trator’ means the Administrator of the National
3 Oceanic and Atmospheric Administration.

4 “(2) ADVISORY COUNCIL.—The term ‘Advisory
5 Council’ refers to the Climate Services Advisory
6 Council.

7 “(3) CLIMATE CHANGE.—The term ‘climate
8 change’ means any change in climate over time,
9 whether due to natural variability or as a result of
10 human activity.

11 “(4) CLIMATE VARIABILITY.—The term ‘climate
12 variability’ means variations in the mean state and
13 other statistics of the climate on all temporal and
14 spatial scales beyond that of individual weather
15 events.

16 “(5) DIRECTOR.—The term ‘Director’ means
17 the Director of the National Oceanic and Atmos-
18 pheric Administration’s National Climate Service.

19 “(6) GLOBAL CHANGE RESEARCH PROGRAM.—
20 The term ‘Global Change Research Program’ means
21 the United States Global Change Research Program
22 established under section 103 of the Global Change
23 Research Act of 1990 (15 U.S.C. 2933).

24 “(7) SECRETARY.—The term ‘Secretary’ means
25 the Secretary of Commerce.

1 “(8) SERVICE.—The term ‘Service’ means the
2 National Oceanic and Atmospheric Administration’s
3 National Climate Service.

4 **“SEC. 8. AUTHORIZATION OF APPROPRIATIONS.**

5 “There are authorized to be appropriated to the Sec-
6 retary to carry out this Act—

7 “(1) \$300,000,000 for fiscal year 2008;

8 “(2) \$350,000,000 for fiscal year 2009;

9 “(3) \$400,000,000 for fiscal year 2010;

10 “(4) \$450,000,000 for fiscal year 2011; and

11 “(5) \$500,000,000 for fiscal year 2012.”.

12 **TITLE III—TECHNOLOGY**
13 **ASSESSMENT**

14 **SEC. 301. NATIONAL SCIENCE AND TECHNOLOGY ASSESS-**
15 **MENT SERVICE.**

16 The National Science and Technology Policy, Organi-
17 zation, and Priorities Act of 1976 (42 U.S.C. 6601 et seq.)
18 is amended by adding at the end the following:

19 **“TITLE VII—NATIONAL SCIENCE**
20 **AND TECHNOLOGY ASSESS-**
21 **MENT SERVICE**

22 **“SEC. 701. ESTABLISHMENT.**

23 “There is hereby created a Science and Technology
24 Assessment Service which shall be within and responsible
25 to the legislative branch of the Government.

1 **“SEC. 702. COMPOSITION.**

2 “The Service shall consist of a Science and Tech-
3 nology Board which shall formulate and promulgate the
4 policies of the Service, and a Director who shall carry out
5 such policies and administer the operations of the Service.

6 **“SEC. 703. FUNCTIONS AND DUTIES.**

7 “The Service shall coordinate and develop informa-
8 tion for Congress relating to the uses and application of
9 technology to address current national science and tech-
10 nology policy issues. In developing such technical assess-
11 ments for Congress, the Service shall utilize, to the extent
12 practicable, experts selected in coordination with the Na-
13 tional Research Council.

14 **“SEC. 704. INITIATION OF ACTIVITIES.**

15 “Science and technology assessment activities under-
16 taken by the Service may be initiated upon the request
17 of—

18 “(1) the Chairman of any standing, special, or
19 select committee of either House of the Congress, or
20 of any joint committee of the Congress, acting for
21 himself or at the request of the ranking minority
22 member or a majority of the committee members;

23 “(2) the Board; or

24 “(3) the Director.

1 **“SEC. 705. ADMINISTRATION AND SUPPORT.**

2 “The Director of the Science and Technology Assess-
3 ment Service shall be appointed by the Board and shall
4 serve for a term of 6 years unless sooner removed by the
5 Board. The Director shall receive basic pay at the rate
6 provided for level III of the Executive Schedule under sec-
7 tion 5314 of title 5, United States Code. The Director
8 shall contract for administrative support from the Library
9 of Congress.

10 **“SEC. 706. AUTHORITY.**

11 “The Service shall have the authority, within the lim-
12 its of available appropriations, to do all things necessary
13 to carry out the provisions of this section, including, but
14 without being limited to, the authority to—

15 “(1) make full use of competent personnel and
16 organizations outside the Office, public or private,
17 and form special ad hoc task forces or make other
18 arrangements when appropriate;

19 “(2) enter into contracts or other arrangements
20 as may be necessary for the conduct of the work of
21 the Office with any agency or instrumentality of the
22 United States, with any State, territory, or posses-
23 sion or any political subdivision thereof, or with any
24 person, firm, association, corporation, or educational
25 institution, with or without reimbursement, without

1 performance or other bonds, and without regard to
2 section 3709 of the Revised Statutes (41 U.S.C. 51);

3 “(3) accept and utilize the services of voluntary
4 and uncompensated personnel necessary for the con-
5 duct of the work of the Service and provide trans-
6 portation and subsistence as authorized by section
7 5703 of title 5, United States Code, for persons
8 serving without compensation; and

9 “(4) prescribe such rules and regulations as it
10 deems necessary governing the operation and organi-
11 zation of the Service.

12 **“SEC. 707. BOARD.**

13 “The Board shall consist of 13 members as follows—

14 “(1) 6 Members of the Senate, appointed by the
15 President pro tempore of the Senate, 3 from the ma-
16 jority party and 3 from the minority party;

17 “(2) 6 Members of the House of Representa-
18 tives appointed by the Speaker of the House of Rep-
19 resentatives, 3 from the majority party and 3 from
20 the minority party; and

21 “(3) the Director, who shall not be a voting
22 member.

23 **“SEC. 708. REPORT TO CONGRESS.**

24 “The Service shall submit to the Congress an annual
25 report which shall include, but not be limited to, an eval-

1 uation of technology assessment techniques and identifica-
2 tion, insofar as may be feasible, of technological areas and
3 programs requiring future analysis. The annual report
4 shall be submitted not later than March 15 of each year.

5 **“SEC. 709. AUTHORIZATION OF APPROPRIATIONS.**

6 “There are authorized to be appropriated to the Serv-
7 ice such sums as are necessary to fulfill the requirements
8 of this title.”.

9 **TITLE IV—CLIMATE CHANGE**
10 **TECHNOLOGY**

11 **SEC. 401. NIST GREENHOUSE GAS FUNCTIONS.**

12 Section 2(c) of the National Institute of Standards
13 and Technology Act (15 U.S.C. 272(c)) is amended—

14 (1) by striking “and” after the semicolon in
15 paragraph (21);

16 (2) by redesignating paragraph (22) as para-
17 graph (23); and

18 (3) by inserting after paragraph (21) the fol-
19 lowing:

20 “(22) perform research to develop enhanced
21 measurements, calibrations, standards, and tech-
22 nologies which will enable the reduced production in
23 the United States of greenhouse gases associated
24 with global warming, including carbon dioxide, meth-

1 ane, nitrous oxide, ozone, perfluorocarbons,
2 hydrofluorocarbons, and sulfur hexafluoride; and”.

3 **SEC. 402. DEVELOPMENT OF NEW MEASUREMENT TECH-**
4 **NOLOGIES.**

5 The Secretary of Commerce shall initiate a program
6 to develop, with technical assistance from appropriate
7 Federal agencies, innovative standards and measurement
8 technologies (including technologies to measure carbon
9 changes due to changes in land use cover) to calculate—

10 (1) greenhouse gas emissions and reductions
11 from sequestration, agriculture, forestry, and other
12 land use practices;

13 (2) noncarbon dioxide greenhouse gas emissions
14 from transportation;

15 (3) greenhouse gas emissions from facilities or
16 sources using remote sensing technology; and

17 (4) any other greenhouse gas emission or reduc-
18 tions for which no accurate or reliable measurement
19 technology exists.

20 **SEC. 403. ENHANCED ENVIRONMENTAL MEASUREMENTS**
21 **AND STANDARDS.**

22 The National Institute of Standards and Technology
23 Act (15 U.S.C. 271 et seq.) is amended—

24 (1) by redesignating sections 17 through 32 as
25 sections 18 through 33, respectively; and

1 (2) by inserting after section 16 the following:

2 **“SEC. 17. CLIMATE CHANGE STANDARDS AND PROCESSES.**

3 “(a) IN GENERAL.—The Director shall establish
4 within the Institute a program to perform and support re-
5 search on global climate change standards and processes,
6 with the goal of providing scientific and technical knowl-
7 edge applicable to the reduction of greenhouse gases (as
8 defined in section 4 of the Global Climate Change Act of
9 2002).

10 “(b) RESEARCH PROGRAM.—

11 “(1) IN GENERAL.—The Director is authorized
12 to conduct, directly or through contracts or grants,
13 a global climate change standards and processes re-
14 search program.

15 “(2) RESEARCH PROJECTS.—The specific con-
16 tents and priorities of the research program shall be
17 determined in consultation with appropriate Federal
18 agencies, including the Environmental Protection
19 Agency, the National Oceanic and Atmospheric Ad-
20 ministration, and the National Aeronautics and
21 Space Administration. The program generally shall
22 include basic and applied research—

23 “(A) to develop and provide the enhanced
24 measurements, calibrations, data, models, and

1 reference material standards which will enable
2 the monitoring of greenhouse gases;

3 “(B) to develop and provide standards,
4 measurements, and innovative technologies for
5 reducing greenhouse gas emissions in existing
6 industries;

7 “(C) to develop and provide standards,
8 measurements, measurement tools, and calibra-
9 tions that will enhance and promote remote
10 sensing technologies;

11 “(D) to assist in establishing a baseline
12 reference point for future trading in greenhouse
13 gases and the measurement of progress in emis-
14 sions reduction;

15 “(E) to develop and provide standards,
16 measurements, measurement tools, calibrations,
17 data, models, and other innovative technologies
18 to support the validation and accreditation of a
19 greenhouse gas trading industry;

20 “(F) to assist in developing improved in-
21 dustrial processes designed to reduce or elimi-
22 nate greenhouse gases, including the develop-
23 ment of measurement tools and standards to
24 validate and accredit a carbon offset industry;
25 and

1 “(G) that will be exchanged internationally
2 as scientific or technical information which has
3 the stated purpose of developing mutually rec-
4 ognized measurements, standards, and proce-
5 dures for reducing greenhouse gases.

6 “(c) NATIONAL MEASUREMENT LABORATORIES.—

7 “(1) IN GENERAL.—In carrying out this sec-
8 tion, the Director shall utilize the collective skills of
9 the National Measurement Laboratories of the Na-
10 tional Institute of Standards and Technology to im-
11 prove the accuracy of measurements that will permit
12 better understanding and control of these industrial
13 chemical processes and result in the reduction or
14 elimination of greenhouse gases.

15 “(2) MATERIAL, PROCESS, AND BUILDING RE-
16 SEARCH.—The National Measurement Laboratories
17 shall conduct research under this subsection that in-
18 cludes—

19 “(A) developing material and manufac-
20 turing processes which are designed for energy
21 efficiency and reduced greenhouse gas emissions
22 into the environment;

23 “(B) developing environmentally-friendly,
24 ‘green’ chemical processes to be used by indus-
25 try; and

1 “(C) enhancing building performance with
2 a focus in developing standards or tools which
3 will help incorporate low- or no-emission tech-
4 nologies into building designs.

5 “(3) STANDARDS AND TOOLS.—The National
6 Measurement Laboratories shall develop standards
7 and tools under this subsection that include software
8 to assist designers in selecting alternate building
9 materials, performance data on materials, artificial
10 intelligence-aided design procedures for building sub-
11 systems and ‘smart buildings’, and improved test
12 methods and rating procedures for evaluating the
13 energy performance of residential and commercial
14 appliances and products.

15 “(d) NATIONAL VOLUNTARY LABORATORY ACCREDI-
16 TATION PROGRAM.—The Director shall utilize the Na-
17 tional Voluntary Laboratory Accreditation Program under
18 this section to establish a program to include specific cali-
19 bration or test standards and related methods and proto-
20 cols assembled to satisfy the unique needs for accredita-
21 tion in measuring the production of greenhouse gases. In
22 carrying out this subsection the Director may cooperate
23 with other departments and agencies of the Federal Gov-
24 ernment, State and local governments, and private organi-
25 zations.”.

1 **SEC. 404. TECHNOLOGY DEVELOPMENT AND DIFFUSION.**

2 The Director of the National Institute of Standards
3 and Technology, through the Manufacturing Extension
4 Partnership Program, may develop a program to support
5 the implementation of new “green” manufacturing tech-
6 nologies and techniques by the more than 380,000 small
7 business manufacturers.

8 **SEC. 405. AUTHORIZATION OF APPROPRIATIONS.**

9 There are authorized to be appropriated to the Direc-
10 tor of the National Institute of Standards and Technology
11 to carry out this title and section 17 of the National Insti-
12 tute of Standards and Technology Act as added by section
13 403 of this title, \$15,000,000 for each of fiscal years 2008
14 through 2010.

15 **TITLE V—ABRUPT CLIMATE**
16 **CHANGE**

17 **SEC. 501. ABRUPT CLIMATE CHANGE RESEARCH PROGRAM.**

18 The Secretary of Commerce shall establish within the
19 Office of Oceanic and Atmospheric Research of the Na-
20 tional Oceanic and Atmospheric Administration, and shall
21 carry out, a program of scientific research on abrupt cli-
22 mate change.

23 **SEC. 502. PURPOSES OF PROGRAM.**

24 The purposes of the program are—

25 (1) to develop a global array of terrestrial and
26 oceanographic indicators of paleoclimate in order to

1 sufficiently identify and describe past instances of
2 abrupt climate change;

3 (2) to improve understanding of thresholds and
4 nonlinearities in geophysical systems related to the
5 mechanisms of abrupt climate change;

6 (3) to incorporate such mechanisms into ad-
7 vanced geophysical models of climate change; and

8 (4) to test the output of such models against an
9 improved global array of records of past abrupt cli-
10 mate changes.

11 **SEC. 503. ABRUPT CLIMATE CHANGE DEFINED.**

12 In this title, the term “abrupt climate change” means
13 a change in the climate that occurs so rapidly or unexpect-
14 edly that human or natural systems have difficulty adapt-
15 ing to the climate as changed.

16 **SEC. 504. AUTHORIZATION OF APPROPRIATIONS.**

17 There are authorized to be appropriated to the De-
18 partment of Commerce for each of fiscal years 2009
19 through 2014, to remain available until expended, such
20 sums as are necessary, not to exceed \$10,000,000, to
21 carry out the research program required by section 501.

○