

111TH CONGRESS
1ST SESSION

S. 1485

To improve hurricane preparedness by establishing the National Hurricane Research Initiative, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JULY 21, 2009

Mr. MARTINEZ (for himself and Mr. NELSON of Florida) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

A BILL

To improve hurricane preparedness by establishing the National Hurricane Research Initiative, 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; TABLE OF CONTENTS.**

4 (a) SHORT TITLE.—This Act may be cited as the
5 “National Hurricane Research Initiative Act of 2009”.

6 (b) TABLE OF CONTENTS.—The table of contents for
7 this Act is as follows:

- Sec. 1. Short title; table of contents.
- Sec. 2. Findings.
- Sec. 3. Sense of Congress.
- Sec. 4. Definitions.

Sec. 5. National Hurricane Research Initiative.
 Sec. 6. National Hurricane Research Task Force.
 Sec. 7. National Hurricane Research.
 Sec. 8. Authorization of appropriations.
 Sec. 9. Independent review.

1 **SEC. 2. FINDINGS.**

2 Congress makes the following findings:

3 (1) Hurricanes and other tropical cyclones have
 4 directly caused more than 2,000 deaths in the
 5 United States since 2003 and account for approxi-
 6 mately 66 percent of insured losses due to natural
 7 hazards.

8 (2) While the ability to understand and predict
 9 hurricanes and other tropical cyclones has improved
 10 since 1999, particularly with respect to storm track-
 11 ing, much remains unknown concerning—

12 (A) storm dynamics, rapid intensity
 13 change, and impact on extratropical cyclones;

14 (B) the interactions of storms with natural
 15 and built environments; and

16 (C) the impacts to and response of society
 17 to destructive storms.

18 (3) Several expert assessments of the state of
 19 hurricane science and research needs have been pub-
 20 lished, including—

21 (A) the January 2007 report by the Na-
 22 tional Science Board titled, “Hurricane Warn-

1 ing: The Critical Need for a National Hurricane
2 Initiative”;

3 (B) the February 2007 report by the Of-
4 fice of the Federal Coordinator for Meteorolog-
5 ical Services and Supporting Research entitled,
6 “Interagency Strategic Research Plan for Trop-
7 ical Cyclones: The Way Ahead”; and

8 (C) reports from the Hurricane Intensity
9 Working Group of the National Science Advi-
10 sory Board of the National Oceanic and Atmos-
11 pheric Administration.

12 (4) In the June 2005 publication, “Grand Chal-
13 lenges for Disaster Reduction”, and in related 2008
14 implementation plans for hurricane and coastal in-
15 undation hazards the Subcommittee on Disaster Re-
16 duction of the Committee on Environment and Nat-
17 ural Resources of the National Science and Tech-
18 nology Council prioritized Federal science and tech-
19 nology investments needed to reduce future loss of
20 life and property caused, both directly and indirectly,
21 by hurricanes and other coastal storms.

22 (5) A National Hurricane Research Initiative
23 complements the objectives of the National Wind-
24 storm Impact Reduction Program.

1 **SEC. 3. SENSE OF CONGRESS.**

2 It is the sense of Congress that, consistent with the
3 findings of the expert assessments and strategies de-
4 scribed in paragraphs (3) and (4) of section 2, a National
5 Hurricane Research Initiative should be established to ad-
6 dress the urgent and compelling need to undertake long-
7 term, coordinated, multi-entity hurricane research focused
8 on—

9 (1) conducting high priority scientific, engineer-
10 ing, and related social and behavioral studies; and

11 (2) effectively applying the research results of
12 such studies to mitigate the impacts of hurricanes
13 on society.

14 **SEC. 4. DEFINITIONS.**

15 In this Act:

16 (1) **TASK FORCE.**—The term “Task Force”
17 means the National Hurricane Research Task Force
18 established under section 6(a).

19 (2) **ELIGIBLE ENTITIES.**—The term “eligible
20 entities” means State, regional, and local govern-
21 ment agencies and departments, tribal governments,
22 universities, research institutes, and nongovern-
23 mental organizations.

24 (3) **INDIAN TRIBE.**—The term “Indian tribe”
25 has the meaning given the term in section 102 of the

1 Federally Recognized Indian Tribe List Act of 1994
2 (25 U.S.C. 479a).

3 (4) INITIATIVE.—The term “Initiative” means
4 the National Hurricane Research Initiative estab-
5 lished under section 5(a)(1).

6 (5) NATIONAL WINDSTORM IMPACT REDUCTION
7 PROGRAM.—The term “National Windstorm Impact
8 Reduction Program” means the program established
9 by section 204 of the National Windstorm Impact
10 Reduction Act of 2004 (42 U.S.C. 15703).

11 (6) STATE.—The term “State” means any
12 State of the United States, the District of Columbia,
13 American Samoa, Guam, the Commonwealth of the
14 Northern Mariana Islands, Puerto Rico, and the
15 Virgin Islands.

16 (7) TRIBAL GOVERNMENT.—The term “tribal
17 government” means the governing body of an Indian
18 tribe.

19 (8) UNDER SECRETARY.—The term “Under
20 Secretary” means the Under Secretary for Oceans
21 and Atmosphere.

22 **SEC. 5. NATIONAL HURRICANE RESEARCH INITIATIVE.**

23 (a) ESTABLISHMENT.—

24 (1) IN GENERAL.—The Under Secretary, in col-
25 laboration with the Director of the National Science

1 Foundation, shall establish an initiative to be known
2 as the “National Hurricane Research Initiative” for
3 the purposes described in paragraph (2). The Initia-
4 tive shall consist of—

5 (A) the activities of the Under Secretary
6 under this section;

7 (B) the activities of the Task Force under
8 section 6; and

9 (C) the research carried out under section
10 7.

11 (2) PURPOSES.—The purposes described in this
12 paragraph are as follows:

13 (A) To improve understanding and pre-
14 diction of hurricanes and other tropical storms,
15 including—

16 (i) storm tracking and prediction;

17 (ii) forecasting of storm formation, in-
18 tensity, and wind and rain patterns, both
19 within the tropics and as the storms move
20 poleward;

21 (iii) storm surge modeling, inland
22 flood modeling, and coastal erosion;

23 (iv) the interaction with and impacts
24 of storms with the natural and built envi-
25 ronment; and

1 (v) the impacts to and response of so-
 2 ciety to destructive storms, including the
 3 socio-economic impacts requiring emer-
 4 gency management, response, and recov-
 5 ery.

6 (B) To develop infrastructure that is resil-
 7 ient to the forces associated with hurricanes
 8 and other tropical storms.

9 (C) To mitigate the impacts of hurricanes
 10 on coastal populations, the coastal built envi-
 11 ronment, and natural resources, including—

12 (i) coral reefs;

13 (ii) mangroves;

14 (iii) wetlands; and

15 (iv) other natural systems that can re-
 16 duce hurricane wind and flood forces.

17 (D) To provide training for the next gen-
 18 eration of hurricane researchers and fore-
 19 casters.

20 (b) IMPLEMENTATION PLAN.—

21 (1) IN GENERAL.—Not later than 18 months
 22 after the date of the enactment of this Act, the
 23 Under Secretary shall develop a detailed, 5-year im-
 24 plementation plan for the Initiative that—

1 (A) incorporates the priorities for Federal
2 science and technology investments set forth in
3 the June 2005 publication, “Grand Challenges
4 for Disaster Reduction”, and in related 2008
5 implementation plans for hurricane and coastal
6 inundation hazards of the Subcommittee on
7 Disaster Reduction of the Committee on Envi-
8 ronment and Natural Resources of the National
9 Science and Technology Council;

10 (B) to the extent practicable and as appro-
11 priate, establishes benchmarks, milestones,
12 goals, and performance measures to track
13 progress of the research carried out under the
14 Initiative and the application of research results
15 for reducing hurricane losses and related public
16 benefits, as recommended by the Task Force
17 under section 6(f)(2); and

18 (C) identifies opportunities to leverage the
19 results of the research carried out under section
20 7 with other Federal and non-Federal hurricane
21 research, coordination, and loss-reduction initia-
22 tives, such as—

23 (i) the National Windstorm Impact
24 Reduction Program established by section

204(a) of the National Windstorm Impact
Reduction Act of 2004 (15 U.S.C. 15703);

(ii) the National Flood Insurance Pro-
gram established under chapter 1 of the
National Flood Insurance Act of 1968 (42
U.S.C. 4011 et seq.);

(iii) the initiatives of the Robert T.
Stafford Disaster Relief and Emergency
Assistance Act (42 U.S.C. 5121 et seq.);

(iv) wind hazard mitigation initiatives
carried out by a State;

(v) the Hurricane Forecast Improve-
ment Project of the National Oceanic and
Atmospheric Administration; and

(vi) the Working Group for Tropical
Cyclone Research of the Office of the Fed-
eral Coordinator for Meteorological Serv-
ices and Supporting Research.

(2) REVIEW.—Not later than 18 months after
the date of the enactment of this Act, the Under
Secretary shall ensure that the implementation plan
required by paragraph (1) is reviewed by—

(A) the Director of the National Science
Foundation;

(B) the Secretary of Homeland Security;

1 (C) the Director of the National Institute
2 for Standards and Technology;

3 (D) the Commanding General of the U.S.
4 Army Corps of Engineers;

5 (E) the Commander of the Naval
6 Meteorology and Oceanography Command;

7 (F) the Associate Administrator for
8 Science Mission Directorate of the National
9 Aeronautics and Space Administration; and

10 (G) the Director of the U.S. Geological
11 Survey.

12 (3) REVISIONS.—The Under Secretary shall re-
13 vise the implementation plan required by paragraph
14 (1) not less frequently than once every 5 years to
15 address and respond to the findings and rec-
16 ommendations of the Task Force.

17 (c) RESEARCH.—

18 (1) ESTABLISHMENT OF RESEARCH OBJEC-
19 TIVES.—The Under Secretary shall, in consultation
20 with the Director of the National Science Founda-
21 tion, establish objectives for research carried out
22 pursuant to section 7 that are based on the findings
23 of the expert assessments and strategies described in
24 paragraphs (3) and (4) of section 2.

1 (2) COORDINATION.—In carrying out the provi-
2 sions of this subsection, the Under Secretary shall
3 coordinate with the Task Force to the extent prac-
4 ticable.

5 (d) NATIONAL WORKSHOPS AND CONFERENCES.—
6 The Under Secretary, in coordination with the Director
7 of the National Science Foundation and the Task Force,
8 shall carry out a series of national workshops and con-
9 ferences that assemble a broad collection of scientific dis-
10 ciplines—

11 (1) to address hurricane-related research ques-
12 tions; and

13 (2) to encourage researchers to work collabo-
14 ratively to carry out the purposes described in sub-
15 section (a)(2).

16 (e) PUBLIC INTERNET WEBSITE.—The Under Sec-
17 retary, in coordination with the Task Force, shall facilitate
18 the establishment of a public Internet website for the Ini-
19 tiative—

20 (1) to foster collaboration and interactive dia-
21 logues among the Under Secretary, the Director of
22 the National Science Foundation, the Task Force,
23 and the public; and

24 (2) to enhance public access to Initiative docu-
25 ments and products, including—

1 (A) information about the members of the
2 Task Force, including their affiliation and con-
3 tact information;

4 (B) meeting agenda and minutes of the
5 Task Force;

6 (C) reports and publications of the Initia-
7 tive;

8 (D) the most recent 5-year implementation
9 plan developed under subsection (b); and

10 (E) the most recent annual report sub-
11 mitted to Congress under subsection (f).

12 (f) ANNUAL REPORT.—

13 (1) REQUIREMENT FOR ANNUAL CROSSCUT
14 BUDGET AND REPORT.—The Under Secretary, in
15 conjunction with members of the Task Force who
16 represent Federal agencies, the Office of Science and
17 Technology Policy, and the Office of Management
18 and Budget, shall submit to Congress each year, to-
19 gether with documents submitted to Congress in
20 support of the budget of the President for the fiscal
21 year beginning in such year (as submitted pursuant
22 to section 1105 of title 31, United States Code), a
23 coordinated annual report for the Initiative for the
24 fiscal year in which the report is submitted and the
25 last fiscal year ending before such submittal.

1 (2) CONTENTS.—The report required by para-
2 graph (1) shall—

3 (A) document the funds transferred by the
4 Under Secretary to the heads of other Federal
5 agencies under section 8(b);

6 (B) document the grants and contracts
7 awarded to eligible entities under section 7;

8 (C) for each agency that receives funds
9 under section 8(b) and eligible entity that re-
10 ceives a grant or contract under section 7, iden-
11 tify what major activities were undertaken with
12 such funds, grants, and contracts; and

13 (D) for each research activity or group of
14 activities described in section 7(c), as appro-
15 priate, identify any accomplishments, which
16 may include full or partial achievement of
17 benchmarks, milestones, goals, performance
18 measure targets established for the implementa-
19 tion plan under subsection (b)(1)(B).

20 **SEC. 6. NATIONAL HURRICANE RESEARCH TASK FORCE.**

21 (a) ESTABLISHMENT.—Not later than 90 days after
22 the date of the enactment of this Act, the Under Secretary
23 shall establish a task force to be known as the “National
24 Hurricane Research Task Force” to facilitate and coordi-

1 nate the efforts of Federal agencies and eligible entities
2 in support of the Initiative.

3 (b) MEMBERSHIP.—The Task Force shall be com-
4 posed of the following:

5 (1) The Under Secretary, or the Under Sec-
6 retary's designee.

7 (2) The Director of the National Science Foun-
8 dation, or the Director's designee.

9 (3) The Director of the National Institute of
10 Standards and Technology, or the Director's des-
11 ignee.

12 (4) The Secretary of Homeland Security, or the
13 Secretary's designee.

14 (5) The Commanding General of the U.S. Army
15 Corps of Engineers, or the Commanding General's
16 designee.

17 (6) The Director of the United States Geologi-
18 cal Survey, or the Director's designee.

19 (7) The Administrator of the National Aero-
20 nautics and Space Administration, or the Adminis-
21 trator's designee.

22 (8) One member shall be appointed by the Sec-
23 retary of Defense, who shall be a representative of
24 the Office of Naval Research or the Chief of Naval
25 Operations.

1 (9) The Federal Coordinator for Meteorological
2 Services and Supporting Research.

3 (10) The Director of the Office of Science and
4 Technology Policy, or the Director's designee.

5 (11) The Director of the Office of Management
6 and Budget, or the Director's designee.

7 (12) The Chair of the Executive Committee of
8 the Federal Geographic Data Committee, or the
9 Chair's designee.

10 (13) Such other members from Federal agen-
11 cies as the chairpersons of the Task Force jointly
12 consider appropriate.

13 (14) Members who are not employees of the
14 Federal Government, selected jointly by the chair-
15 persons of the Task Force in consultation with the
16 National Academy of Sciences and the National
17 Academy of Engineering, as follows:

18 (A) At least 3 members who are prominent
19 in the fields of hurricane science, engineering,
20 social science, or related fields.

21 (B) At least 1 member who represents a
22 State government agency responsible for emer-
23 gency management and response.

1 (C) At least 3 members who represent the
2 views of local governments, tribal governments,
3 and nongovernmental organizations.

4 (D) At least 2 members who represent pri-
5 vate sector interests engaged in hurricane re-
6 search, preparedness, response, or recovery.

7 (E) At least 1 member who represents a
8 State floodplain or coastal zone manager.

9 (F) Such other members as may be appro-
10 priate.

11 (c) CHAIRPERSONS.—The concurrent chairpersons of
12 the Task Force shall be the following:

13 (1) The Under Secretary, or the Under Sec-
14 retary's designee under subsection (b)(1).

15 (2) The Director of the National Science Foun-
16 dation, or the Director's designee under subsection
17 (b)(2).

18 (3) The Director of the National Institute of
19 Standards and Technology, or the Director's des-
20 ignee under subsection (b)(3).

21 (d) INITIAL MEETING.—Not later than 120 days
22 after the date of the enactment of this Act, the Task Force
23 shall hold its first meeting.

1 (e) MEETINGS.—The Task Force shall meet at the
2 call of the chairpersons of the Task Force, but not less
3 frequently than twice each year.

4 (f) DUTIES.—The duties of the Task Force are as
5 follows:

6 (1) To provide assistance to the Under Sec-
7 retary with the development of the 5-year implemen-
8 tation plan required by section 5(b).

9 (2) Not later than 270 days after the date of
10 the enactment of this Act and in consideration of the
11 expert findings referred to in section 2(3)—

12 (A) to develop and furnish to the Under
13 Secretary findings and recommendations, as ap-
14 propriate, for monitoring research progress and
15 for a set of benchmarks, milestones, goals, and
16 performance measures to track the transition
17 and application of research results for reducing
18 hurricane losses and related public benefits
19 under the Initiative;

20 (B) to identify interim and long-term goals
21 of the research program under section 7; and

22 (C) to prioritize the activities of the Initia-
23 tive over a 10-year period.

24 (3) To improve communication and coordina-
25 tion among Federal agencies with respect to hurri-

1 cane-related research, developments in hurricane
2 forecasting and operations, and best practices for
3 applying results of Initiative research to reduce loss
4 of life and property damage resulting from hurri-
5 canes.

6 (4) To identify opportunities to leverage the ac-
7 tivities and products of the Initiative with the Na-
8 tional Windstorm Impact Reduction Program and
9 other Federal and non-Federal hurricane research,
10 coordination, and loss reduction programs.

11 (5) To recommend a model described in section
12 7(c)(1)(A) and monitor progress on development of
13 such model.

14 (6) To make recommendations to the Under
15 Secretary and the Director of the National Science
16 Foundation on research priorities and content and
17 structure of the program established under section
18 7(a)(1).

19 (7) To make recommendations on national hur-
20 ricane research observation and data requirements.

21 (8) To assess opportunities to leverage the ca-
22 pabilities of the following stakeholders:

23 (A) Federal, State, and local governments.

24 (B) Tribal governments.

25 (C) Academic and research institutions.

1 (D) Entities from the private sector.

2 (E) Nongovernmental organizations.

3 (9) To evaluate the extent to which the stake-
4 holders described in paragraph (8) have been en-
5 gaged as partners and collaborators in the Initiative.

6 (10) To assist the Under Secretary in facili-
7 tating the development of the annual report required
8 by section 5(f).

9 (11) To review such report and provide com-
10 ments to the Under Secretary.

11 (12) To submit to the National Science and
12 Technology Council and to Congress, together with
13 documents submitted to Congress in support of the
14 budget of the President for the 2012 fiscal year (as
15 submitted pursuant to section 1105 of title 31,
16 United States Code), a report containing a com-
17 prehensive review of the progress of the Initiative in
18 meeting the needs of the United States to under-
19 stand hurricanes, their impacts on natural and built
20 environment, and methods to mitigate such impacts.

21 (g) ADVISORY BODIES.—

22 (1) AUTHORITY TO ESTABLISH.—The Task
23 Force may establish such advisory bodies as the
24 Task Force considers necessary to assist the Task
25 Force in its duties under subsection (f).

1 (2) CRITERIA.—An advisory body established
2 under paragraph (1) shall represent a broad variety
3 of private and public interests.

4 (h) ADVISORS TO THE TASK FORCE.—The Task
5 Force may seek advice and input from any interested,
6 knowledgeable, or affected party as the Task Force con-
7 siders necessary to carry out the duties under subsection
8 (f).

9 (i) COMPENSATION.—

10 (1) IN GENERAL.—All members of the Task
11 Force who are officers or employees of the United
12 States shall serve without compensation in addition
13 to that received for their services as officers or em-
14 ployees of the United States.

15 (2) TRAVEL EXPENSES.—The members of the
16 Task Force shall be allowed travel expenses, includ-
17 ing per diem in lieu of subsistence, at rates author-
18 ized for employees of agencies under subchapter I of
19 chapter 57 of title 5, United States Code, while
20 away from their homes or regular places of business
21 in the performance of services for the Task Force.

22 (j) PROCUREMENT OF TEMPORARY AND INTERMIT-
23 TENT SERVICES.—The Chairpersons may procure tem-
24 porary and intermittent services under section 3109(b) of
25 title 5, United States Code, at rates for individuals which

1 do not exceed the daily equivalent of the annual rate of
 2 basic pay prescribed for level V of the Executive Schedule
 3 under section 5316 of such title.

4 (k) VOLUNTEER SERVICES.—Notwithstanding sec-
 5 tion 1342 of title 31, United States Code, the Commission
 6 may accept and use voluntary and uncompensated services
 7 as the Commission determines necessary.

8 (l) EXEMPTION FROM FACA NOTICE REQUIREMENT
 9 FOR TASK FORCE ADVISORY BODIES.—An advisory body
 10 established by the Task Force under subsection (g) shall
 11 not be subject to section 10(a)(2) of the Federal Advisory
 12 Committee Act (5 U.S.C. App. 10(a)(2)).

13 (m) TERMINATION OF TASK FORCE.—The Task
 14 Force shall terminate on September 30, 2018.

15 **SEC. 7. NATIONAL HURRICANE RESEARCH.**

16 (a) NATIONAL SCIENCE FOUNDATION COMPETITIVE
 17 GRANT RESEARCH PROGRAM.—

18 (1) IN GENERAL.—The Director of the National
 19 Science Foundation, in coordination with the Under
 20 Secretary, shall establish a program to award grants
 21 to eligible entities to carry out—

22 (A) research described in subsection (c); or
 23 (B) other research that is consistent with
 24 the research objectives established under section
 25 5(c)(1).

1 (2) SELECTION.—The National Science Foun-
 2 dation shall select grant recipients under this section
 3 through its merit review process.

4 (b) NATIONAL OCEANIC AND ATMOSPHERIC ADMIN-
 5 ISTRATION RESEARCH PROGRAM.—

6 (1) IN GENERAL.—The Under Secretary shall
 7 carry out a program of research described in sub-
 8 section (c) or other research that is consistent with
 9 the research objectives established under section
 10 5(c)(1).

11 (2) RESEARCH ACTIVITIES.—Research carried
 12 out under paragraph (1) may be carried out
 13 through—

14 (A) intramural research;

15 (B) awarding grants to eligible entities to
 16 carry out research;

17 (C) contracting with eligible entities to
 18 carry out research; or

19 (D) entering into cooperative agreements
 20 to carry out research.

21 (c) RESEARCH.—The research described in this sub-
 22 section is research that is consistent with the purposes de-
 23 scribed in section 5(a)(2) and is described by one or more
 24 of the following:

1 (1) FUNDAMENTAL HURRICANE RESEARCH.—
 2 Fundamental hurricane research, which may consist
 3 of the following:

4 (A) COMMUNITY RESEARCH MODELS.—Re-
 5 search to support continued development and
 6 maintenance of community weather research
 7 and forecast models recommended by the Task
 8 Force under section 6(f)(5), including advanced
 9 methods of observing storm structure and as-
 10 similating observations into the models, in
 11 which the agency or institution hosting the
 12 models ensures broad access and use of the
 13 model by members of the Task Force and the
 14 civilian research community.

15 (B) PREDICTING HURRICANE INTENSITY
 16 AND STRUCTURE.—Research to improve under-
 17 standing and prediction of—

- 18 (i) storm formation and tracking with
- 19 extended time scale to weeks in advance;
- 20 (ii) rapid changes in storm size, mo-
- 21 tion, structure, and intensity;
- 22 (iii) the internal dynamics of storms;
- 23 (iv) the transition to extratropical
- 24 characteristics as storms move poleward;
- 25 and

1 (v) the interactions of storms with en-
 2 vironmental conditions, including the at-
 3 mosphere, ocean, and land surface.

4 (C) UNDERSTANDING AIR AND SEA INTER-
 5 ACTIONS.—Research regarding observations,
 6 theory, and modeling to improve understanding
 7 of air and sea interaction in hurricanes and
 8 other high wind speed environments.

9 (D) PREDICTING STORM SURGE, WAVES,
 10 RAINFALL, INLAND FLOODING, AND STRONG
 11 WINDS PRODUCED BY HURRICANES.—Research
 12 to understand, model, and predict rainfall,
 13 coastal and riverline flooding, high winds, and
 14 the potential occurrence of tornadoes, including
 15 probabilistic modeling, mapping, and visualiza-
 16 tion of risk.

17 (E) RELATIONSHIPS BETWEEN HURRI-
 18 CANES AND CLIMATE VARIABILITY AND
 19 CHANGE.—Research to improve the under-
 20 standing of the complex relationships between
 21 hurricanes and climate on seasonal to decadal
 22 time scales, such as research to determine the
 23 most effective methods to use observational in-
 24 formation and numerical-model simulations to
 25 examine short-term and long-term impacts of

climate on changes in storm intensity, geographic distribution, and frequency.

(F) RELATIONSHIPS BETWEEN HURRICANES AND ECOSYSTEMS.—Research to improve the understanding of how hurricanes affect ecosystems, landscapes, and natural resources and to develop assessments for hurricane vulnerability and risk, including—

(i) how ecosystems have been influenced by past hurricanes and the ability and capacity of ecosystems to recover from the effects of hurricanes;

(ii) how ecosystem management practices can minimize disruptions to ecosystem functions and dependent economic uses as a result of hurricanes; and

(iii) the role of natural features, such as barrier islands, wetlands, and mangroves, in—

(I) acting as natural buffers to wind and flood forces; and

(II) improving coastal resiliency.

(2) TECHNOLOGY ASSESSMENT AND DEVELOPMENT.—Technology assessment and development, which may consist of the following:

(A) IMPROVED OBSERVATION OF HURRICANES AND TROPICAL STORMS.—Research to improve hurricane and tropical storm observations and to improve the understanding of the complex nature of storms and their interaction with the natural and built environment through development and application of new technologies, such as—

(i) mobile radars and advanced airborne observing technologies;

(ii) global positioning system technology;

(iii) unmanned vehicles;

(iv) satellite-based sensors;

(v) ground-based and aerial wireless sensors; and

(vi) other geospatial technologies and geospatial data, including bathymetry and elevation.

(B) COMPUTATIONAL CAPABILITY.—Research and development of robust computational capabilities and facilities required to conduct numerical and other types of modeling that support the scientific studies and research carried out under the Initiative as well as data

acquisition and modeling during hurricane events, including research to improve understanding of the efficient utility of multiple models that—

(i) require sharing and interoperability of databases, computing environments, networks, visualization tools, and analytic systems that improve on such technologies that are available on the date of the enactment of this Act; and

(ii) are used for transitioning hurricane research assets into operational practice.

(C) TECHNOLOGIES FOR DISASTER RESPONSE AND RECOVERY.—Research to improve damage assessments after a hurricane and emergency communications during hurricane response and recovery, including improvements to—

(i) communications networks for government agencies and nongovernmental entities;

(ii) network interoperability;

(iii) cyber-security during hurricane or storm related emergencies; and

1 (iv) use of models, remote sensing,
 2 and statistically based ground sampling to
 3 support effective and rapid damage assess-
 4 ment to scale disaster response and recov-
 5 ery needs.

6 (3) RESEARCH INTEGRATION, TRANSITION, AND
 7 APPLICATION.—Research on integration, transition,
 8 and application of research results, which may con-
 9 sist of the following:

10 (A) TRANSITION OF RESEARCH TO OPER-
 11 ATIONS.—Research to develop mechanisms to
 12 accelerate the application of improved models,
 13 observations, communication, and risk assess-
 14 ment systems, and related research products to
 15 forecasting and other operational settings, in-
 16 cluding use of 1 or more developmental test
 17 beds.

18 (B) ASSESSING VULNERABLE INFRASTRUC-
 19 TURE.—Developing a national engineering as-
 20 sessment and clearinghouse of coastal infra-
 21 structure by leveraging and building upon exist-
 22 ing Federal activities, resources, and research,
 23 including infrastructure related to levees, sea
 24 walls, and similar coastal flood-protection struc-
 25 tures, drainage systems, bridges, water and

1 sewage utilities, power, and communications, to
 2 determine the level of vulnerability of such in-
 3 frastructure to damage from hurricanes.

4 (C) INTERACTION OF HURRICANES WITH
 5 ENGINEERED STRUCTURES.—Research to im-
 6 prove understanding of the impacts of hurri-
 7 canes and tropical storms on buildings, struc-
 8 tures, and housing combined with modeling that
 9 is essential for guiding the creation of improved
 10 building designs and construction codes in loca-
 11 tions particularly vulnerable to hurricanes.

12 (D) EVACUATION PLANNING.—Research to
 13 improve the manner in which hurricane-related
 14 information is provided to, and utilized by, the
 15 public and government officials, including re-
 16 search to assist officials of State, tribal, re-
 17 gional, or local governments in—

- 18 (i) determining the circumstances in
- 19 which evacuations are required; and
- 20 (ii) carrying out such evacuations.

21 (E) DECISION SUPPORT.—Research to—

- 22 (i) assess the social, behavioral, and
- 23 economic factors that influence decision
- 24 making by the public, government officials,
- 25 nongovernmental entities, the private sec-

tor, and other impacted populations before,
during, and in the aftermath of hurricanes;

(ii) improve the translation of natural
science and engineering research carried
out under the Initiative into informed deci-
sion making that enables communities,
economies, and the man-made and natural
environments to become resilient to hurri-
cane impacts, including development of ef-
fective risk and vulnerability assessment
and risk communication tools; and

(iii) develop methods of assessing dis-
aster recovery costs, both government and
nongovernment, and of comparing the rel-
ative benefits of disaster mitigation meth-
ods with disaster recovery costs.

SEC. 8. AUTHORIZATION OF APPROPRIATIONS.

(a) IN GENERAL.—There are authorized to be appro-
priated for fiscal years 2010 through 2015 amounts as
follows:

(1) To the Under Secretary, \$18,750,000 to
carry out sections 5, 6, and 7(b), of which not less
than \$13,750,000 shall be used to carry such section
7(b).

1 (2) To the Director of the National Science
2 Foundation, \$56,250,000 to carry out sections 5
3 and 7(a).

4 (b) INTERAGENCY TRANSFER OF FUNDS.—

5 (1) TRANSFERS BY UNDER SECRETARY FOR
6 OCEANS AND ATMOSPHERE.—Of amounts appro-
7 priated pursuant to the authorization of appropria-
8 tions under subsection (a)(1), the Under Secretary
9 may transfer to the heads of other Federal agencies
10 such amounts as the Under Secretary considers ap-
11 propriate to carry out sections 5, 6, and 7(b).

12 (2) TRANSFERS BY DIRECTOR OF THE NA-
13 TIONAL SCIENCE FOUNDATION.—Of amounts appro-
14 priated pursuant to the authorization of appropria-
15 tions under subsection (a)(2), the Director of the
16 National Science Foundation may transfer to the
17 heads of other Federal agencies such amounts as the
18 Director considers appropriate to carry out sections
19 5 and 7(a).

20 **SEC. 9. INDEPENDENT REVIEW.**

21 (a) AGREEMENT.—

22 (1) IN GENERAL.—The Under Secretary shall
23 seek to enter into an agreement with the National
24 Research Council of the National Academies for the

1 National Research Council to perform the services
2 covered by this section.

3 (2) TIMING.—The Under Secretary shall seek
4 to enter into the agreement described in paragraph
5 (1) not later than 180 days after the date of the en-
6 actment of this Act.

7 (b) INDEPENDENT REVIEW OF NATIONAL HURRI-
8 CANE RESEARCH INITIATIVE.—Under an agreement be-
9 tween the Under Secretary and the National Research
10 Council under this section, the National Research Council
11 shall carry out an independent review of the Initiative. In
12 carrying out the review, the National Research Council
13 shall review the following:

14 (1) Whether the Initiative has well-defined,
15 prioritized, and appropriate research objectives.

16 (2) Whether the Initiative is properly coordi-
17 nated among relevant Federal agencies and stake-
18 holders.

19 (3) Whether the Initiative has allocated appro-
20 priate resources to each of the research objectives.

21 (4) Whether suitable mechanisms exist for
22 transitioning the research results from the Initiative
23 into operational technologies and procedures and ac-
24 tivities in a timely manner.

1 (c) REPORT.—Not later than 4 years after the date
2 of the enactment of this Act, the Under Secretary shall
3 submit to the Committee on Commerce, Science, and
4 Transportation of the Senate and the Committee on
5 Science and Technology of the House of Representatives
6 a report on the results of the review carried out under
7 this section.

8 (d) AUTHORIZATION OF APPROPRIATIONS.—There is
9 authorized to be appropriated to the Under Secretary,
10 \$750,000 to carry out this section.

○