

**SCIENCE, ENGINEERING, AND EDUCATION  
FOR SUSTAINABILITY (SEES)**

**\$80,500,000**  
**-\$58,500,000 / -42.1%**

**Overview**

A sustainable world is one in which human needs are met equitably without harm to the environment and without sacrificing the ability of future generations to meet their needs. Meeting this formidable challenge requires an increase in understanding of the integrated system of society, the natural world, and the alterations humans bring to Earth. NSF’s Science, Engineering, and Education for Sustainability (SEES) activities aim to address this need through support for interdisciplinary research and education activities that cross the boundaries of the physical sciences, natural sciences, engineering, mathematics, computational sciences, human behavior, the social and economic sciences, and educational sciences to develop new understandings, theories, models, and technologies.

**Total Funding for SEES**

(Dollars in Millions)

FY 2014 Actual	FY 2015 Estimate	FY 2016 Request
<b>\$164.49</b>	<b>\$139.00</b>	<b>\$80.50</b>

**Goals**

SEES activities span the entire range of scientific domains at NSF and have three overarching multi-year goals:

- 1) Support interdisciplinary research and education that can facilitate the move towards global sustainability;
- 2) Build linkages among existing projects and partners and add new participants in the sustainability research enterprise; and
- 3) Develop a workforce trained in the interdisciplinary scholarship needed to understand and address the complex issues of sustainability.

**Approach**

SEES is a multi-year effort to coordinate and grow research and education associated with the environment, energy, and sustainability. NSF’s work under SEES is a blend of activities – formal solicitations and less formal announcements of interest (e.g., Dear Colleague Letters) – that span multiple scientific disciplines and require input and oversight from multiple NSF directorates. Research on complex environmental pathways is supported and emphasized across NSF and is supplemented by activities focused on sustainable materials and technologies. SEES activities also help to build up the cross-disciplinary workforce for sustainability research and education, and to engage students and the public on sustainability science and engineering and their social implications. NSF conducts this work in awareness of and in concert with other federal agencies and national and international stakeholder groups whose function and mission complement NSF’s role to ensure that sustainability goals are carried forward.

SEES programs are rooted in long-term, ongoing, environmental, energy, and education research. The portfolio approach—as opposed to a large single program—facilitates coordination, monitoring, and impact across the major investment areas and also across NSF, as SEES activities are complex and highly interdisciplinary. The SEES organizational structure includes:

- A senior leadership committee composed of assistant directors/office heads to provide overall planning and guidance;

- A cross-agency SEES Implementation Group composed of division directors and lead program directors, who develop consistent guidelines, provide internal and external communication, and shape evaluation plans;
- Working groups of program directors, each overseen by assistant directors/office heads/division directors who are most relevant to the specific activity to manage programs or activities; and
- Interagency working groups and international partnerships to carry out transition planning as the initiative sunsets.

NSF leadership recognizes the need for cross-cutting investments and interdisciplinary teaming to take on the challenge of sustainability research. There is continued need to support research collaborations that develop new understanding, theories, models, and technologies, educate the future workforce, and inform the public.

### Investment Framework

#### SEES Funding by Directorate

(Dollars in Millions)

Dir/Office	FY 2014 Actual	FY 2015 Estimate	FY 2016 Request
BIO	\$31.00	\$21.00	\$17.50
CISE	13.92	11.00	-
ENG	13.20	12.00	3.00
GEO	68.00	59.00	34.00
MPS	25.36	22.50	16.00
SBE	3.01	3.50	-
OISE	10.00	10.00	10.00
<b>Total</b>	<b>\$164.49</b>	<b>\$139.00</b>	<b>\$80.50</b>

Totals may not add due to rounding.

#### **FY 2010 – FY 2013**

NSF established the SEES investment area in FY 2010 in order to use a systems-based approach to understanding, predicting, and reacting to change in the linked natural, social, and built environment and to address challenges in environmental and energy research and education. The initial programs in FY 2010 were Dimensions of Biodiversity (DoB), Earth Systems Modeling (EaSM), Ocean Acidification (OA), and Water Sustainability and Climate (WSC). NSF has supported sustainability-related research and education for decades. The SEES portfolio builds on this foundation and draws programs that address sustainability into a common framework to optimize investments and outcomes.

#### **FY 2014 – FY 2015**

In FY 2014, NSF continued to support important scientific and societal contributions, and to make significant progress toward achieving programmatic goals. In FY 2015, SEES passes the mid-point of its planned lifetime and enters a transition period toward “sunsetting” in FY 2017, the last year in which funds will formally be associated with the SEES activity. The FY 2015 Estimate for SEES is \$139.0 million. In FY 2015, NSF will continue investment in SEES programs initiated in FY 2010-2014, with the exception of Sustainable Energy Pathways (SEP), OA, SEES Fellows, and Research Coordination Network (RCN-) SEES track. SEES programs will continue to support important scientific and societal contributions during the phase-down period, and will make significant progress toward achieving programmatic goals through projects currently underway.

SEES competitions held, ongoing, or expected to run in FY 2014-2015 include: DoB, Earth Systems Modeling (EaSM), WSC, CyberSEES, Coastal SEES, Dynamics of Coupled Natural and Human Systems (CNH), Hazards and Disasters (Hazards SEES), Sustainable Chemistry, Engineering and Materials (SusChEM), Arctic SEES, and Food Systems. Of particular note is the Sustainability Research Networks (SRN) solicitation issued in FY 2014 that will build linkages to expedite progress in understanding the complicated landscape of urban sustainability, which has emerged as a critical need for the 21<sup>st</sup> century.

### **FY 2016 Request**

Consistent with the planned “sunsetting”, further reductions are planned for FY 2016 and FY 2017. The total request for SEES in FY 2016 is \$80.50 million. Funding will support the following SEES programs: DoB, EaSM, SRN, Coastal SEES, Hazards SEES, SusChEM, and Partnerships for International Research and Education (PIRE) (ongoing sustainability-focused projects from FY 2012 competition).

Long-term planning will continue to stress consolidation and coordination of existing activities; networking and dissemination of information from the growing SEES knowledge base to the scientific community, policy-makers, and the public; and the workforce development critical for producing the next generation of sustainability scientists and engineers. The EaSM, Hazards SEES, and WSC programs will end, but important elements of these programs will form the basis of standing programs that will be piloted in the final years of the SEES investment area. Funding for research related to Food Systems will transition out of SEES and be folded into the new NSF-wide Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) activity.

### **FY 2017**

FY 2017 is the last year in which funding will be formally associated with the SEES portfolio. NSF staff and managers will be finalizing implementation of follow-on activities for other SEES programs and sustainability themes to ensure a well-informed transition. As there is keen interest and need for hazards-related research, currently, NSF senior management is planning for the Hazards and Water Sustainability and Climate programs to continue beyond 2017 and to be supported by at least three NSF directorates. SusChEM is anticipated to transition to an ongoing program among three NSF directorates. Other SEES programs with ongoing community interest that will be supported through NSF core programs include: ArcSEES, Coastal SEES, DoB, EaSM, OA, and CNH.

Certain SEES programs that were intended as short-term catalysts to boost community interest and capacity and complement other NSF programs will be discontinued, including SRN, PIRE (SEES-focused 5-year awards made in 2012), and Small Business Technology Transfer Program (STTR)-SEES. In the case of SRN, the program will conclude as SRN competitions have served the purpose of establishing community partnerships in emerging sustainability science and engineering areas.

### **Evaluation Framework**

Significant thought has gone into how to define success under SEES, and monitoring and evaluation have been aspects of the SEES portfolio since its inception. NSF has received abundant internal and external feedback on the portfolio and its programs through trans-disciplinary workshops, Advisory Committee meetings, a National Academy conference, and various newsletters, articles, and publications. NSF will employ a variety of tools to evaluate the scientific impact and progress of the various programs in the SEES portfolio. In FY 2014, NSF issued a Request for Quotes and awarded a contract for evaluation of the SEES portfolio. Evaluation activities under the contract include:

- **Evaluation Design and Plan** – developing research questions and framework for analysis, including logic models, and developing data collection instruments and methodologies for those analyses (final plan delivered December 2014)

- **Historical Review** – understanding of sustainability related activities over time, how SEES fits into history, and to discern if the coordinated approach under SEES has brought about different outcomes in terms of increased productivity, scientific findings, and interest level (internally and externally) (draft delivered December 2014);
- **Comparative Analysis of SEES and non-SEES NSF programs** – to determine if activities conducted and programs developed under the SEES portfolio are achieving different outcomes compared to similar NSF programs, and if the SEES portfolio is filling a gap in the sustainability science, engineering, and education enterprise (draft sub-task delivered October 2014); and
- **Network Analysis** – development of collaboration indicators, influence of participation in SEES programs on individual researchers, and a comparison of networking activities of SEES and non-SEES individuals (planned for 2015/2016).

The progress of the implementation of this investment was monitored and reviewed quarterly as part of a performance goal in FY 2014 and FY 2015. For more information about monitoring key program investments, see the FY 2014 Annual Performance Report in the Performance chapter.