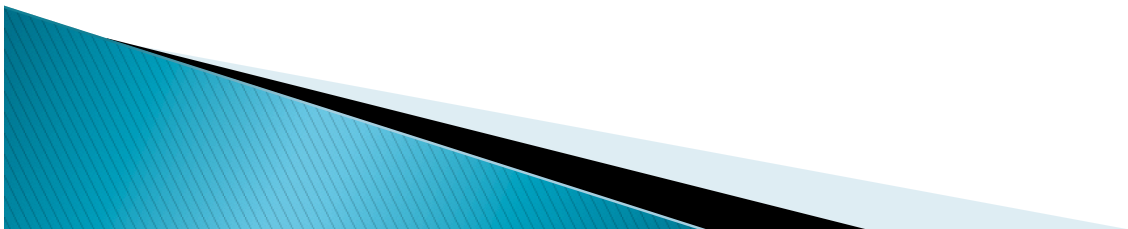


Science, Engineering, and Education for Sustainability SEES Portfolio



Dr. Timothy L. Killeen
Assistant Director for
Geosciences, NSF
February 03, 2011



Towards a Sustainable Human Future

*Whether it's improving our health or harnessing clean energy, protecting our security or succeeding in the global economy, our future depends on reaffirming America's role as the **world's engine of scientific discovery and technological innovation.***

– President Barack Obama



*Of all the challenges we face as a nation and as a planet, none is as pressing as the three-pronged challenge of **climate change, sustainable development and the need to foster new and cleaner sources of energy.***

(Office of Science and Technology Policy, Executive Office of the President)

Energy consumption growing



today

... to unprecedented demands

2030

A world map showing light patterns, likely representing energy consumption or population density, in a dark blue color scheme. The map is centered on the Atlantic Ocean, with North and South America on the left, Europe and Africa in the center, and Asia and Australia on the right. The light patterns are concentrated in the eastern United States, Europe, and East Asia, indicating high energy demand in these regions. The year 2030 is written in yellow at the bottom center of the map.



Rapid, multi-faceted global change is challenging human well-being

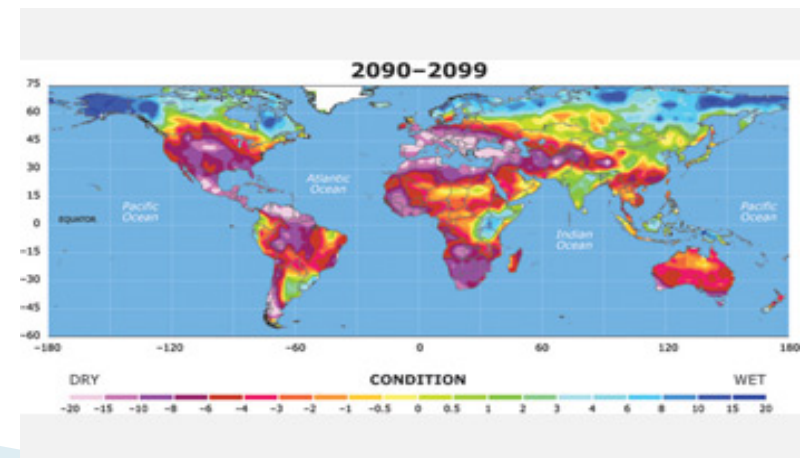


Ships take to Arctic Ocean as Sea Ice Melts. Journey time between Europe and China can be reduced by half. MSNBC.com

Sustainability Science and Engineering

- ▶ National Academy of Sciences definition:
“The interactions between **natural and social systems** and how those interactions affect the challenge of **sustainability**:
sustainability:
▶ ...meeting the needs of present and future generations while substantially reducing poverty and conserving the planet’s life support systems”

www.pnas.org/site/misc/sustainability.shtml



NSF SEES Overview

- ▶ Established FY10, Planned to continue thru FY15
- ▶ Involves all NSF research and education Directorates and offices
Initially focused on the intersection of climate and environment, including specific attention to incorporating the human sciences
- ▶ Encouraged a systems-based approach to understanding, predicting, and reacting to change in the linked natural, social, and built environment.



**Environmental
Research and
Education**



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Proposals and Awards

**Proposal and Award Policies and
Procedures Guide**

Introduction

**Proposal Preparation and
Submission**

- [Grant Proposal Guide](#)
- [Grants.gov Application Guide](#)

Award and Administration

- [Award and Administration Guide](#)

Science, Engineering and Education for Sustainability (SEES) NSF-Wide Investment

NSF established the Science, Engineering, and Education for Sustainability (SEES) investment area in FY 2010 in order to address challenges in climate and energy research and education using a systems-based approach to understanding, predicting, and reacting to change in the linked natural, social, and built environment. Initial efforts were focused on coordination of a suite of research and education programs at the intersection of climate and environment, including specific attention to incorporating human dimensions.

SEES is expected to be a 5-year effort, extending through FY15. Continuing efforts will focus on supporting research that facilitates global community sustainability, specifically through building connections between current projects, creating new nodes of activity, and developing personnel needed to solve sustainability issues. Future efforts will be expanded to include sustainable energy research in science and engineering, and its socioeconomic and environmental

[SEES News &
Updates](#)

[SEES News Releases](#)

[SEES FY 2011
Activities](#)

[SEES FY 2010
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[SEES Portfolio &
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SEES Major Aims

- ▶ Support **research and education** to inform global community sustainability
- ▶ Build **connections** between current projects and create new nodes of activity
- ▶ Develop **personnel** needed to understand complex issues of sustainability



Some specific SEES portfolio examples:

- ▶ research at the energy–environment–society nexus
- ▶ novel energy production, harvesting, storage, transmission, and distribution technologies
- ▶ corresponding adoption, socioeconomic, and policy issues
- ▶ innovative computational science and engineering methods and systems for monitoring, understanding and optimizing life–cycle energy costs and carbon footprints of natural, social and built systems
- ▶ study of societal factors such as vulnerability and resilience, and sensitivity to regional change



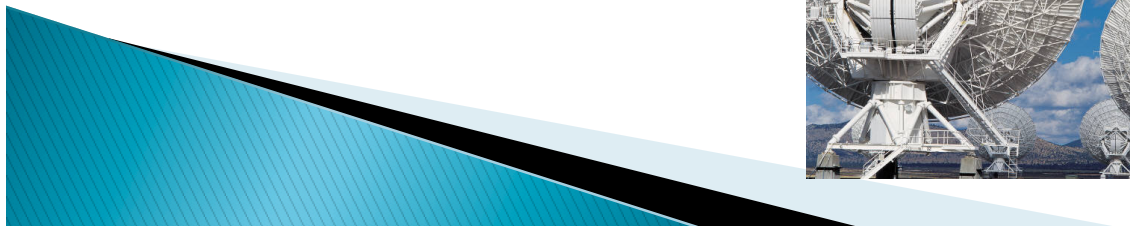
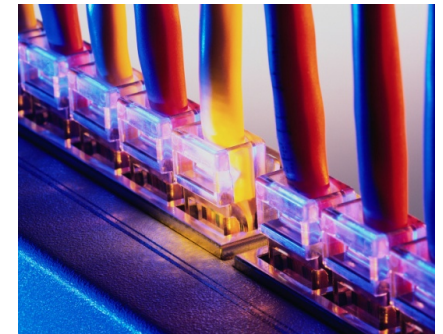
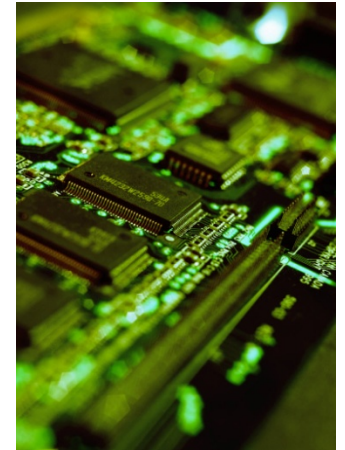
SEES Alignment with NSF's Infrastructure Investments

- ▶ NSF developing *Cyberinfrastructure Framework for 21st Century Science & Engineering (CIF21)*

- Geographically distributed, locally-available cyberinfrastructure
- Advanced computing resources and software environments
- Advanced networks and data storage capabilities

- ▶ **SEES/CIF21 intersection**

- New generation of experimental and observational networks
- Data analysis, modeling, simulation and intelligent decision-making facilitated by advances in computational science



FY10: CRI —Starting (and continuing) point for SEES

- ▶ **CRI: Climate Research Investment**



- ▶ Emphasis on climate and environment, including human sciences

- Water, Sustainability, and Climate (WSC)
- Ocean Acidification (OA)
- Dimensions of Biodiversity (DB)
- Climate Change Education (CCEP)
- Regional and Decadal Earth System Modeling (EaSM)

CRI Statistics

WSC	OA	CCEP-1	BD	EaSM
Letters of Intent				
311	130	174	288	174
Number of Projects				
171	106	110	195	137
Funding Amounts in FY 2010				
\$16 M	\$12 M	\$12 M	\$26 M	\$0 M

Notes: FY10 competitions resulted in:

- 70 awards totaling \$66M (FY10) and \$19M (FY11)
- EaSM awards to be made in FY11, including DOE and USDA funds

FY10 awards



SEES News Releases

- **News Release:** [NSF Awards Grants to Study Effects of Ocean Acidification \(NSF 10-186\)](#) (October 13, 2010)
- **News Release:** [NSF Awards Grants for Study of Water Sustainability and Climate \(NSF 10-182\)](#) (October 6, 2010)
- **News Release:** [NSF Awards Grants to Study Dimensions of Earth's Biodiversity \(NSF 10-179\)](#) (October 5, 2010)
- **News Release:** [Climate Change Education Partnership awards \(NSF 10-165\)](#) (September 10, 2010)
- **News Release:** [Improving Predictions of Climate Change and Its Impacts \(NSF 10-044\)](#) (March 22, 2010)
- **JOINT NSF, DOE, and USDA PRESS CONFERENCE:** [New interagency program to improve predictions of climate change and its impacts](#) (March 22, 2010)

SEES Related News Releases

- **News Release:** [NSF Awards Grants on Interactions Among the Environment, Economy and Society \(NSF 10-194\)](#) (October 19, 2010)
- **News Release:** [NSF Awards Grants for Research on Coupled Natural and Human Systems \(NSF 10-198\)](#) (October 21, 2010)



[Return to SEES Homepage](#)



SEES Focal Points for FY1 1

- ▶ Enhance existing SEES portfolio
- ▶ Support sustainable energy research and socioeconomic, environmental, and educational implications
- ▶ Respond to NSB Sustainable Energy report
 - ▶ **Systems approaches to research programs, education and workforce development, public awareness and engagement**
 - ▶ **Partnerships with other agencies, states, universities, industry, international organizations**



FY 11 NSF SEES Activities

Dear Colleague Letter

- ▶ Highlights NSF's unique role to support research and education to understand complex sustainability issues
- ▶ Describes scope of SEES Portfolio
- ▶ Directs PIs to SEES web site, www.nsf.gov/sees
- ▶ Highlights FY11 SEES activities
 - ▶ Coupled Natural Human systems solicitation (NSF 10-612) encourages SEES themes
 - ▶ Catalyzing New International Collaborations
 - ▶ Research Coordination Networks solicitation (NSF 10-566)
 - ▶ Interdisciplinary workshops



Dynamics of Coupled Natural and Human Systems (CNH)

- CNH (NSF 10–612) encourages SEES themes
- Interdisciplinary standing NSF program (GEO, BIO and SBE).
- Quantitative, interdisciplinary analyses of human and natural system processes and complex interactions at diverse scales
- Adds support for exploratory/new team awards and Research Coordination Networks



Research Coordination Networks

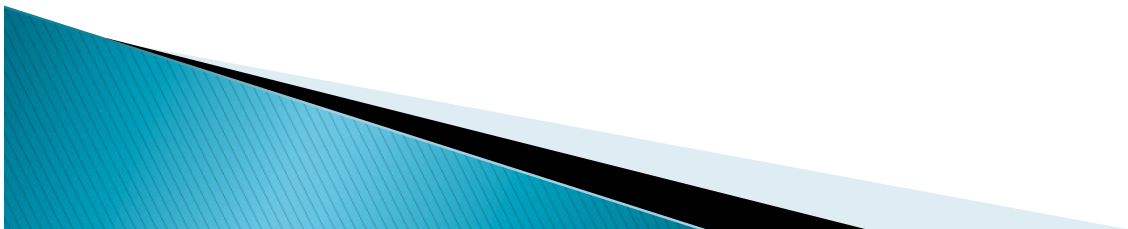
- Supports groups of investigators to communicate and coordinate efforts
- across disciplinary, organizational, institutional and geographical boundaries about a common theme.
- NOT funding a research project
- Include diverse range of career states
- A research theme – question, phenomenon, organism, technology, technique, disciplinary boundary, ...



FY 11 Activities – planned

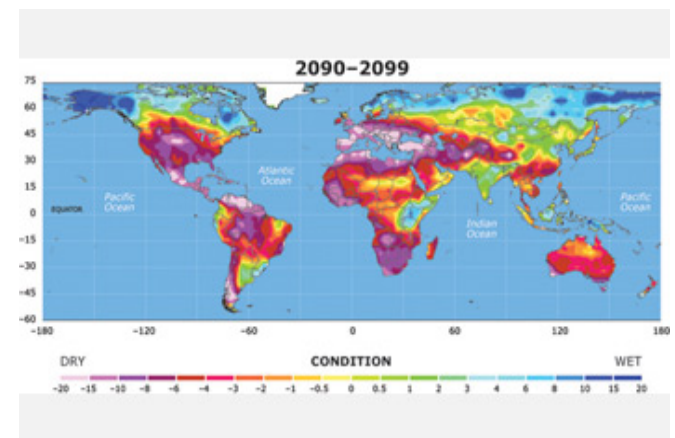
Sustainability Research Networks

- To help build & expand the interdisciplinary community of investigators researching sustainability science and engineering:
 - Addition of a new **SEES** track in the **Research Coordination Networks (RCN)** competition
 - New solicitation for **Sustainability Research Network Competition** is being drafted



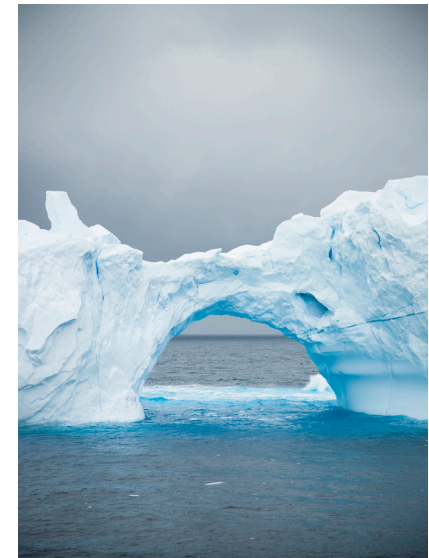
SEES/CRI Competitions

- ▶ **Climate Change Education Partnership (CCEP):** FY11: Supplemental funding for FY10 awardees
FY12: CCEP competition expected
- Dimensions of Biodiversity:**
FY11: January 2011 deadline; up to \$20M for awards
FY12: annual competition expected
- ▶ **Ocean Acidification:**
FY12: Solicitation to be revised in 2011 to spend FY12 funds



SEES/CRI Competitions (cont'd)

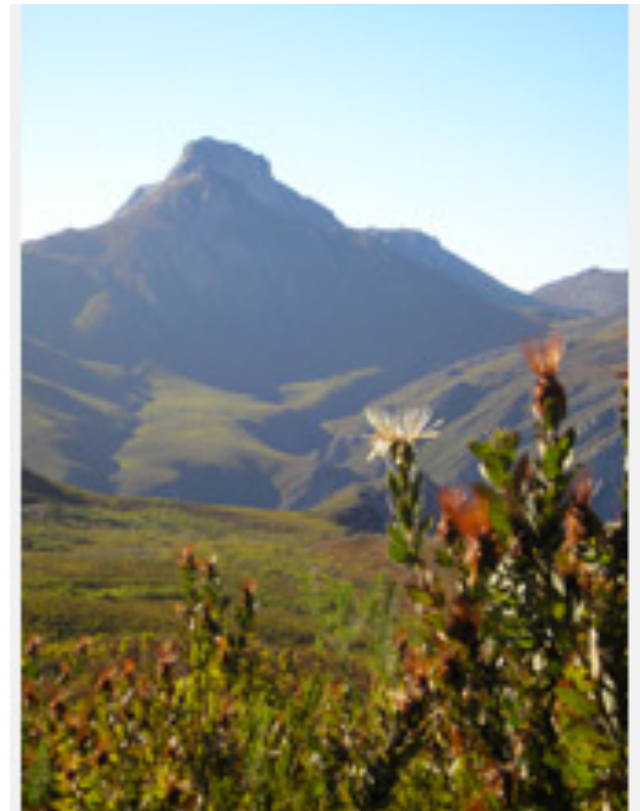
- ▶ **Water Sustainability & Climate:**
FY12: Solicitation revised in 2011 to spend FY12 funds
- ▶ **Decadal & Regional Climate Prediction using Earth System Models (EaSM):**
FY11: \$42.5M to spend on proposals received in 2010
FY13: Anticipate revised solicitation to spend FY13 funds
* FY11 funds expected to be spent on SEES/CRI competitions up to ~\$70M



FY11 Activities

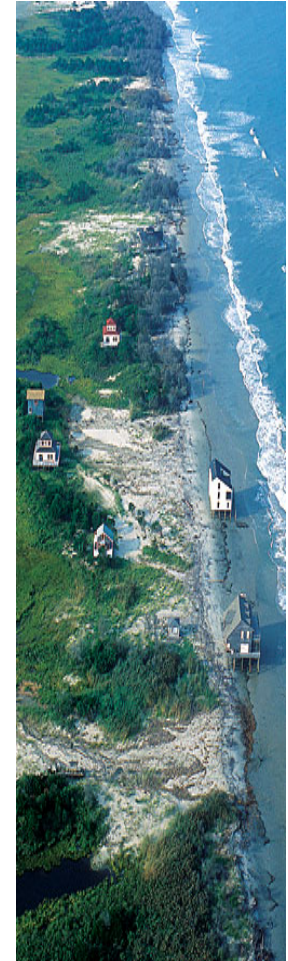
SEES 'Summit'

- ▶ High level, high visibility gathering of national and international experts, distinguished speakers, and some recent SEES/CRI awardees
- ▶ Highlight the work being funded within the SEES portfolio and NSF's unique role
- ▶ High profile attendees, and individuals from many sectors, including other agencies



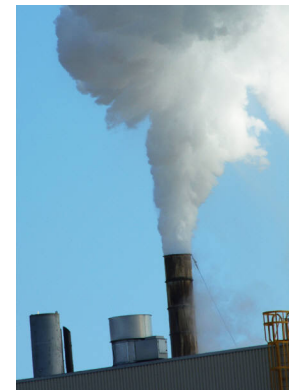
2012 and Beyond – Future SEES Activities

- ▶ **Build out Sustainability Research Networks**
- ▶ **Postdoctoral fellowship solicitation targeted at interdisciplinary SEES Fellows**
- ▶ **Partnerships for International Research and Education (PIRE) solicitation – SEES focus**
- ▶ **Solicitation(s) on vulnerable geographic regions, including coastal areas and the arctic.**



OMB/OSTP Science & Technology FY12 Priorities

- Moving toward a clean energy future to reduce dependence on energy imports while curbing greenhouse gas emissions
- Understanding, adapting to, and mitigating the impacts of global climate change
- Managing competing demands on land, freshwater, and oceans for production of food, fiber, biofuels, and ecosystem services based on sustainability and biodiversity



“After four decades of studying these issues, I’ve concluded that energy is the core of the environment problem, environment is the core of the energy problem, and resolving the energy–economy–environment dilemma is the core of the problem of sustainable well–being for industrial & developing countries alike.”

-- John Holdren



Thanks



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