Computing and Sustainability: Introducing CyberSEES

November 19, 2012
http://www.nsf.gov/sees

Agenda

- **Welcome** — *Susanne Hambrusch*, *Division Director, CISE/CCF*
- **SEES initiative goals** — *Jessica Robin*, *Program Director, GEO/EAR*, *NSF SEES Coordinator*
- **CyberSEES program scope and requirements** — *Ken Whang*, *Program Director, CISE/IIS*, *CyberSEES Coordinator*
- **Related funding opportunities**
- **Questions** — *CyberSEES Team*

The Sustainability Challenge

A sustainable world is one where human needs are met equitably without harm to the environment or sacrificing the ability of future generations to meet their own needs.

Meeting this formidable challenge requires a substantial increase in our 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) Portfolio

SEES Overview

Mission: to advance science, engineering, and education to inform the societal actions needed for environmental and economic sustainability and sustainable human well-being

- Established in Fiscal Year 2010
- Portfolio of existing and new programs
- All NSF Directorates and offices involved
- Partnerships

Science, Engineering, and Education for Sustainability (SEES)

1. **Interdisciplinary research and education** towards global sustainability
2. Link projects and **partners** and add **new participants** to sustainability endeavors
3. Develop the **workforce** to address sustainability

SEES Characteristics

System Thinking

Holistic approaches that link human, built, and natural systems, and reach across disciplines

Partnerships & Networks

Connect intellectually and spatially disparate communities, institutions and organizations

Workforce & Education

Development and education of new researchers and students on critical aspects and issues of sustainability

SEES Themes

Natural Systems

Human Systems

Built Systems

Energy and Materials

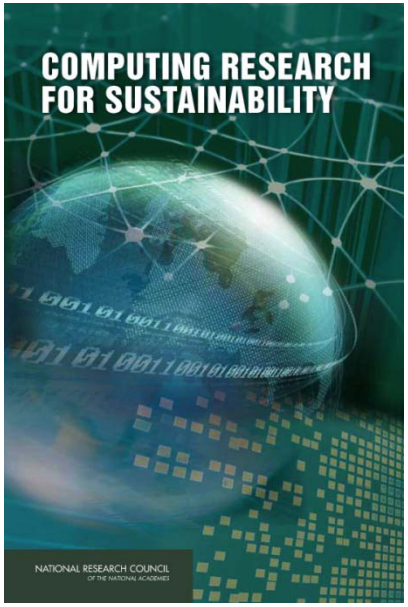
Adaptation and Resilience

SEES Portfolio of Programs

http://www.nsf.gov/sees

Arctic SEES	Dimensions of Biodiversity	Small Business Technology Transfer Program (STTR)
Climate Change Education Partnerships	Interdisciplinary Research in Hazards and Disasters (Hazards SEES)	Sustainable Chemistry, Engineering, and Materials (SusChEM)
Coastal SEES	Ocean Acidification	Sustainable Energy Pathways (SEP)
Cyber-Enabled Sustainability Science and Engineering (CyberSEES)	Partnerships for International Research & Education (PIRE)	Sustainability Research Networks (SRN)
Decadal & Regional Climate Prediction Using Earth System Models (EaSM)	Research Coordination Networks (RCN)	Water Sustainability and Climate (WSC)
Dynamics of Coupled Natural & Human Systems	SEES Fellows	= UPCOMING DEADLINES

The Sustainability Challenge is a Computational Challenge



- Challenges to
  - Measurement and instrumentation
  - Information-intensive systems
  - Modeling, simulation, optimization
  - Human-centered systems
- Conceptual foundations
  - Scale, heterogeneity
  - Uncertainty, complexity
  - Reliability, constraints

National Research Council (2012)
http://www.nap.edu/catalog.php?record_id=13415

Cyber-Enabled Sustainability Science and Engineering (CyberSEES)

NSF 13-500

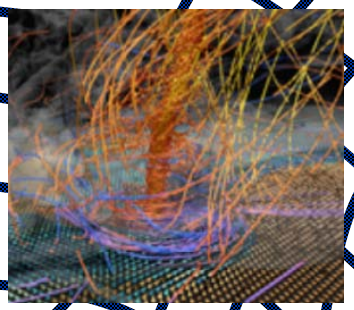
to advance **interdisciplinary research** in which

the **science and engineering of sustainability** are enabled by **new advances in computing**,

and where

computational innovation is grounded in the context of **sustainability problems**

Interdisciplinary computational challenges
are woven into many areas of sustainability research



Robust Observation, Sensing, and Inference

Large-scale Data Analysis and Management

Modeling of Complex Systems

Human-centered Systems

Dynamic and Intelligent Decision Making

Control and Management of Infrastructure

Sustainability of computing technologies

Challenges in managing consumption of **energy, materials, and other resources** have become a critical sustainability issue.

CyberSEES welcomes interdisciplinary research that addresses **holistic, integrative approaches** to sustainable computing, including consideration of design and use with **impact across the lifecycle** in mind.

Sustainability challenges are shaped by human, societal, and economic factors

All SEES projects must consider the social, behavioral, and economic requirements of creating long-term, viable sustainable systems, and incorporate those dimensions in the proposed research.

e.g., human interface, security and privacy, socio-cultural norms, non-compliance, herding behavior, economic incentives, real-world deployability

CyberSEES partnership:
Semiconductor Research Corporation

SRC's Energy Research Initiative is interested in CyberSEES research that addresses **computational aspects of smart infrastructures**, in particular the **smart electric grid**

- efficient, secure power management at multiple scales: from grid-level to personal systems
- integration of renewable and home energy systems into an aware and enabled grid

co-funding in these areas by SRC ERI and NSF

CyberSEES Requirements

The research must be **well-grounded in sustainability issues**.

The research objective must **advance computing or cyberinfrastructure knowledge**, while enabling research in other disciplines.

The team composition must be synergistic and interdisciplinary, and must consist of at least **two investigators** from different scientific disciplines.

The project must **address education and workforce development** in sustainability science.

Solicitation-specific Review Criteria

In addition to Intellectual Merit and Broader Impacts:

- **Well-Grounded in Sustainability Issues**
- **Broadly Applicable Advances in Computing in Tandem with Other Disciplines**
- **Synergistic, Interdisciplinary Team**
- **Education and Workforce Advancements**
- **Quality and Appropriateness of the Management Plan**

Project Types

- **Type 1** proposals
  - up to **$300,000** over **2 years**
  - ***Smaller proof-of-concept, capacity building, or exploratory projects***
  - letter of intent, **10-page** proposal
- **Type 2** proposals
  - up to **$1,200,000** over **up to 4 years**
  - ***Integrative research and education projects***
  - letter of intent, **15-page** proposal

Letters of Intent are Required for all proposals

DUE DECEMBER 4, 2012

- One-page letter of intent **submitted in FastLane** including:
  - Project Title (indicate Type 1 or Type 2)
  - Investigator Team
  - Project Synopsis
- Not for preapproval; no feedback is provided
- Used to plan for proposal review
- One per project, from lead institution

Full Proposals
Type 2

DUE FEBRUARY 5, 2013

15-page Project Description must include:

- Vision Statement
- Background and Significance
- Research Plan
- Evaluation Plan

Supplementary Documents must include:

- Management and Collaboration Plan

Full Proposals
Type 1

DUE FEBRUARY 5, 2013

Within the 10-page Project Description, Type 1 proposals are encouraged to incorporate the same elements (Vision Statement, Background and Significance, Research Plan, and Evaluation Plan) as appropriate to project needs.

Additional Supplementary Documents for Type 1 and Type 2 proposals

- Statement of Consent **required for consideration by SRC ERI**
- Data Management Plan
- Postdoctoral Mentoring Plan, for proposals seeking postdoctoral funds
- Letters to document collaborative commitments as needed, but not letters of support
- No appendices, preprints, etc…

http://www.**nsf**.gov/publications/pub_summ.jsp?ods_key=**gpg**

Proposal Limit

An individual may appear as PI, Co-PI, or Senior Personnel in **no more than two** proposals submitted to CyberSEES

Related Opportunities

http://www.nsf.gov/sees

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Interdisciplinary Research in Hazards and Disasters (Hazards SEES)

NSF 12-610

- **advance understanding of fundamental processes** associated with natural and technological hazards, and their interactions
- **better understand causes, interdependences, impacts and cumulative effects** of hazards on individuals, natural and built environment, and society as a whole
- **improve capabilities** for forecasting or predicting hazards, mitigating effects, and enhancing capacity to respond to and recover

http://cra.org/ccc/docs/init/computingfordisasters.pdf

Type 1 Awards
Forge new or emerging interdisciplinary teams (up to $300K, 2 yrs)

Type 2 Awards
Major new integrated hazards research (up to $3M, 4 yrs)

Proposal deadline:
Feb 4, 2013

NSF SEES Fellows

NSF 12-601

- To facilitate investigations that cross traditional disciplinary boundaries and address issues of sustainability through a systems approach
- Must allow Fellow to obtain research experiences beyond his/her current core disciplinary expertise
- Host and partner mentors
- Plan for professional development

Awards

Up to $88K/year in salary, $20K/year in research expenses, $10K/year in international research costs over 3 years

Eligibility

US citizen, national, or permanent resident

Not in tenure-track or equivalent position

No more than 36 full-time equivalent months in positions requiring doctorate

Deadlines

Nov 26 2012, Nov 21 2013

Small Business Technology Transfer (STTR)
Accelerating Sustainability using Enabling Technologies
NSF 13-501

- Proposals must focus on technologies aimed at **attaining environmental and economic sustainability.**
- Proposers are encouraged to **build partnerships** with research institutions that are part of existing sustainability initiatives in the US.
- Proposers must clearly identify the intended **commercial outcome**.

- Proposals must address one of the subtopics
  - Sustainable Energy
  - Sustainable Chemistry
  - Education for Sustainability
  - Predictive Information Systems
  - Sustainable Materials and Manufacturing
  - Sustainable Biotechnology Applications

Letters of Intent (required): Jan 8, 2013 **Full Proposals: Feb 6, 2013**

Envision a world…

- *smart electric grids*
- *data-enabled precision agriculture*
- *sensor networks in extreme environments*
- *sustainable transportation, communications, water*
- *systems to manage extreme events…*

A rich interplay is developing between computing research and other disciplines to address these ***and many other sustainability challenges****.*

Questions?

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