Earth System Initiative

The Earth System Initiative (ESI) was founded in 2002 to foster and facilitate multidisciplinary research and education efforts in earth and environmental sciences and engineering at MIT, and to enhance strategic communication of the new knowledge and insights gained to citizens, policy makers, and corporate decision makers—those whose decisions and actions ultimately determine how humanity interacts with the global environment: the Earth system. Participating ESI faculty come primarily from the Departments of Civil and Environmental Engineering and Earth, Atmospheric, and Planetary Sciences. However, ESI also draws from the Departments of Chemistry, Electrical Engineering and Computer Science, Mechanical Engineering, Biology, Biological Engineering, Anthropology, and Urban Studies and Planning.

Research Support

As of June 30, ESI's active portfolio of sponsored research totaled just over $37.1 million spread over 51 research accounts under 17 ESI-affiliated faculty. Total research volume for FY2011 was just over $9.1 million. In the eight years since sponsored research under ESI began in 2004, total research volume has totaled more than $59.3 million, for an annual average of just over $7.4 million (see table below). In all, 131 research accounts have been administered through ESI since its inception, with a total value of just over $68.6 million, including funds awarded but not yet spent.

Currently funded research projects include collaborations among faculty in the School of Engineering and the School of Science and bridge the gap between fields such as biology, geology, chemistry, atmospheric sciences, and electrical engineering and computer science.

ESI's research volume for FY2011 dipped more than 9% relative to FY2010, breaking a seven-year string of annual increases, while the total value of its active sponsored research portfolio declined by nearly 18%. These facts can be attributed to the combination of natural funding fluctuations for a relatively small group of principal investigators and the realities of the overall economic climate. A corresponding increase in grant proposals submitted by ESI-affiliated principal investigators is detailed below.

Earth System Initiative sponsored research volume, FY2004–FY2011.

Fiscal year	Research volume ($)
2004	2,013,987
2005	5,028,797
2006	6,901,764
2007	7,486,815
2008	9,054,250
2009	9,646,973
2010	10,084,605
2011	9,133,720
Total	**59,350,911**

Administration

Professor Dara Entekhabi (Civil and Environmental Engineering and Earth, Atmospheric, and Planetary Sciences) has been the faculty director of ESI since July 2008. Professor Entekhabi is also director of the Parsons Laboratory for Environmental Science and Engineering and chair of the MIT Environmental Research Council (ERC). Dr. Kurt Sternlof has been executive director of ESI since February 2009. The faculty director's office is located in Room 48-216G; the executive director's office is in Room 16-177C. ESI operates under the purview of the Vice President for Research.

Highlights and Activities

Proposals Submitted and New Grants Awarded

During FY2011, six ESI-affiliated faculty principal investigators received eight awards for sponsored research, for a total of $2.4M in new funding from sources including the National Science Foundation, NASA, the Joint Institute for Strategic Energy Analysis, Aerodyne Research, and the universities of Hawaii and Michigan. Additionally, 10 ESI-affiliated investigators submitted 31 new proposals to various funding agencies for a requested total of $15.2M. As of June 30, decisions on 25 of these proposals for a requested total of $11.8M were still pending.

In keeping with the year-over-year dip in ESI's FY2011 annual research volume and the total value of its active portfolio, the total of new funding added during FY2011 also dropped some 50% compared to FY2010. In response, the number and total potential value of grant proposals submitted by ESI-affiliated faculty during FY2011 increased by more than 50% relative to FY2010. As a consequence, it is anticipated that the normal upward trend of annual sponsored research volume under ESI will be reestablished during FY2012 and FY2013.

Support of the Environmental Research Council

As chair of the ERC, Professor Entekhabi has made supporting the ERC's work a major focus for ESI. During FY2011, Dr. Sternlof worked closely with Professor Entekhabi and the ERC to create its report to provost Rafael Reif in fulfillment of his May 2010 charge to develop an implementation plan for an environmental research initiative at MIT. Indeed, supporting the ERC's efforts was the major activity of ESI during the year, culminating in the June 30 completion of a final draft report for submission to the provost—Implementing the MIT Global Environment Initiative: The Science of Living on Earth. This plan to create the Global Environment Initiative includes specific provisions for the assets and identity of ESI to be absorbed into the new enterprise.

Participation in the Faculty Environmental Network for Sustainability

Professor Entekhabi and Dr. Sternlof both continued their involvement with the Faculty Environmental Network for Sustainability and its effort to create an undergraduate minor in sustainability at MIT. This educational initiative is proposed to continue under the guidance of the new Global Environment Initiative.

Future of the Oceans Workshop

Within the context of its support of the ERC, ESI played a central role in sponsoring, planning, and convening a special one-day workshop on oceans-oriented research: "The Future of the Oceans—Building a New Agenda for Ocean Research and Education." The event was held on December 2, drawing participation from across MIT and the Woods Hole Oceanographic Institution. The purpose of the workshop was to capture the full breadth of current and future research and education at MIT in all areas related to oceans, specifically to advance the evolution of the oceans theme being developed by the ERC for inclusion in its implementation plan for the Global Environment Initiative. A rousing success, this workshop led directly to a follow-on meeting between MIT and Woods Hole faculty focused on making the vision of a more fruitful and integrated partnership between the two institutions a reality through the Global Environment Initiative. This process will continue into FY2012.

Climate Research Meeting

Also within the context of its support of the ERC, ESI participated in an internal planning meeting focused on climate research held on October 14. The purpose of this meeting, convened by the MIT Joint Program for the Science and Policy of Global Change, was to bring MIT climate science and climate policy faculty together to create a blueprint for the climate theme intended for launch as a flagship component of the Global Environment Initiative. This process will also continue into FY2012.

Terrascope

Terrascope is a yearlong program for freshman designed to impart an appreciation for the complexity of global sustainability issues and a can-do approach to tackling them. Originally the educational component of ESI, Terrascope was removed in 2006 and placed under the Office of the Dean for Undergraduate Education. The two programs still share a suite of offices. During FY2010, Dr. Sternlof refocused ESI's attention on supporting Terrascope, and those efforts extended into FY2011. In particular, ESI took the initiative in working with the office of the Vice President for Resource Development to advance Terrascope's fundraising efforts, and initiated a working relationship between Terrascope and the Earthwatch Institute. Terrascope's theme for AY2010 was "feeding the world," and its annual field trip during spring break was made to Sirsi, India, in partnership with Earthwatch, which maintains a research center in this mountainous agricultural area in the nation's Western Ghats region.

Support for Marine Microenvironments Meeting

In January, ESI-affiliated faculty member Roman Stocker (Civil and Environmental Engineering) hosted an international meeting focused on the central role that marine microenvironments play in modulating biological interactions in the oceans. This special meeting represented a first for an area of science at the very cutting edge of marine microbial ecology, in which MIT (through ESI) is an acknowledged world leader. Associate Professor Stocker and his collaborators won a competition to hold their inaugural meeting at the Aspen Center for Physics in Colorado, and hope to establish the meeting as a regular, biennial event. To support the inaugural meeting, ESI helped

to raise and administer $45,000 in discretionary gifts to offset the attendance costs for graduate students, post-doctoral students, and invited speakers.

Future Directions

In conjunction with the launch of the Global Environment Initiative anticipated during FY2012, the ESI brand will be retired and its active assets—organization, staff, funds, and research portfolio and affiliated faculty—will be rolled into the new enterprise. In particular, the vibrant research portfolio of ESI will comprise the foundation of the Global Environment Initiative's proposed ecological resilience theme, and will provide significant momentum to its oceans theme. Successfully navigating the implementation of this transition will be the central and final task for ESI during FY2012.

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