

Turning White Papers
into Green Solutions

Annual Report of **The Environmental Change Institute**

The Environmental Change Institute
University of Illinois at Urbana-Champaign
350 National Soybean Research Center
1101 West Peabody
Urbana, IL 61801
217-244-0965



Think.  Change.

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Executive Committee

Ms. Malia Andrus
Department of Agricultural
and Biological Engineering
Phone: 217-721-4993
E-mail: applefor@illinois.edu

Dr. John Braden
Department of Agricultural
and Consumer Economics
Phone: 217-333-5501
E-mail: jbb@illinois.edu

Dr. Ximing Cai
Department of Civil
and Environmental Engineering
Phone: 217-333-4935
E-mail: xmcai@illinois.edu

Dr. George Czapar
Illinois State Water Survey
University of Illinois Extension
Phone: 217-333-9545
E-mail: gfc@illinois.edu

Dr. Don Fullerton
Finance Department and IGPA
Phone: 217-244-3621
E-mail: dfullert@illinois.edu

Dr. Wesley Jarrell, Director (ex officio)
Department of Natural Resources
and Environmental Sciences
Phone: 217-244-0384
E-mail: ecic@illinois.edu

Dr. Tom Ulen
College of Law
Phone: 217-333-4953
E-mail: t-ulen@illinois.edu

Dr. Pat Weatherhead
Department of Natural Resources
and Environmental Sciences
Phone: 217-244-0319
E-mail: pweather@illinois.edu

Deans, Sponsoring Colleges

Dr. Robert J. Hauser
Dean, College of ACES
Agricultural, Consumer and
Environmental Sciences
Phone: 217-333-0460
E-mail: r-hauser@illinois.edu

Dr. Larry DeBrock
Dean, College of Business
Phone: 217-333-4553
ldebrock@illinois.edu

Dr. Bruce P. Smith
Dean, College of Law
Phone: 217-244-8446
Email: smithb@illinois.edu

Photo sources:
Wojtek Palmowski: Cover, pages 5, 7, 15, 19
Samantha Carlson page 2
Karen Decker page 2
Eric Jackson page 19

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Vision

The Environmental Change Institute will illuminate the causes and consequences of global environmental change and develop constructive responses through public policies, technologies, and lifestyles.

Mission

The ECI advances our understanding of global environmental change and offers solutions to avoid, mitigate, or adapt to its effects through support of scholarly research, innovative teaching, and public outreach.

Goals

- Enhance and promote holistic thinking about interactions among climate, food and energy systems, demographic pressures, and justice and dignity;
- Inspire real-world debates relating to global environmental change;
- Generate a cadre of highly-motivated, broadly-trained, and ethically aware leaders for the 21st century;
- Understand the impact of the changing environment on humans and assure effective and just adaptation;
- Enhance the balance of human needs and the integrity of natural systems.



From the Founder

Joel M. Friedman, JD

As the Environmental Change Institute (ECI) completes its second year, its trajectory is rising. Supported by The Alvin H. Baum Family Fund, The University of Illinois, Executive Director Wesley Jarrell, Ph.D. and his dedicated staff, ECI remains true to its founding vision and mission. The organization is building momentum in pursuit of the best ways to dovetail big ideas and best practices into a systematic approach to mitigate adverse environmental change. In a period of extreme uncertainty and economic upheaval, ECI might reasonably be tempted to let up. In fact, it has done just the opposite.

ECI regards the challenges presented by (1) environmental change, and (2) the ways individuals and organizations allocate and consume energy, as among the greatest opportunities ever. The sheer magnitude of possibilities sparks a combination of apprehension, awe and excitement. It is through exactly the kinds of inquiry ECI was founded to undertake that we can mitigate the human role in bringing about adverse environmental change and make ourselves stronger, fitter, more entrepreneurial, more competitive and less susceptible to the vagaries of forces we cannot control, whether environmental, economic, or political.

To amplify the progress from Year One, across the Illinois campus and nationwide, ECI is building a phalanx of interested students, scientists, policy makers, entrepreneurs and established corporations. This expanding group is advancing ECI's understanding, projecting our message to yet a broader audience, and driving policy and business transformations. ECI remains confident that through our collective effort – from the most sweeping policy reach to the most individual, personal decision to ride a bike to work – we can reverse the course of human effects on climate change, improve our reputation worldwide, and our standing in the global economy. In short we are 'turning white papers into green solutions.'

We invite you to read about ECI's progress here, and challenge you to engage with us, whatever your point of view.

ECI continues to fund cross-disciplinary academic courses and commit matching funds for research and seed grants. This year the organization began funding ECI Fellows, who are charismatic and influential scholars early in their careers who help extend the reach of ECI in teaching, research, policy and entrepreneurship. The 2009 Cap and Trade Summit was one of the broadest concentrations of carbon offset expertise ever assembled, and the 2010 Summit on ways of adapting to and mitigating effects of climate change on agriculture treats a more fundamental topic: how to create food for the world's fast-increasing population without distressing the Earth.

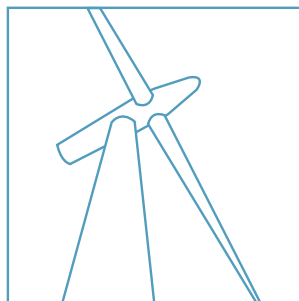
Consistent with other mission-based organizations, ECI grapples with the best ideas to fund, and the grim reality that there will always be a limit on resources. The tough act of prioritizing spotlights the hard choices, and reminds us of the likelihood that people, politicians, and governments may never agree on programs like Cap and Trade, a tax on carbon, and EPA regulation. ECI understands that pragmatically speaking, other less incendiary initiatives may actually gain traction faster and be more cost-effective, and thereby capable of producing meaningful, beneficial effects.

It is inspiring to support the work of ECI as it matures and flourishes. The vision to synchronize the best environmental science, the most enlightened policy and front line entrepreneurship to benefit the greater good remains not only viable, but the most compelling many of us have ever faced. We invite you to read about ECI's progress here, and challenge you to engage with us, from whatever your point of view.



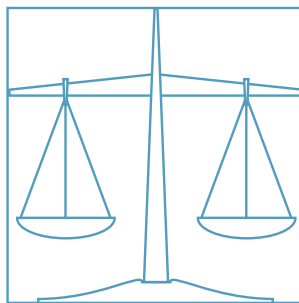
Food systems and security

Food supplies, quality, and prices, both locally and globally, will be destabilized by climatic changes and energy supply and cost-related disruptions. New plant varieties, crop management systems, and appropriate and efficient processing and distribution systems must be developed to address these risks.



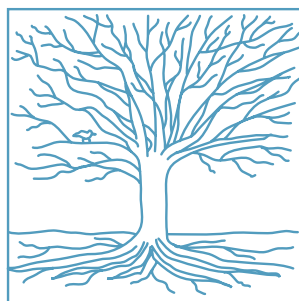
Resource and energy use

The dynamics and quantity of resource availability, including water and wind, will change. Storage of water - groundwater, reservoirs and lakes, and snow pack - will change, affecting water supplies and quality. Strong weather events can destabilize dams, levees, wastewater treatment facilities and drinking water supplies, and risk must be managed. Increased heat will increase demand for cooling, driving the need for comfortable living and working environments that use little or no external energy.



Public policy and social and economic well-being

The science underlying the threats to food systems and security, as well as resource and energy use, must be applied to inform the policies that guide public response, and private response through business decisions.



Biodiversity and ecosystem health

The biological elements of natural and agricultural ecosystems will respond to a generally warming climate by genetically evolving (naturally or through managed genetic change, e.g., plant breeding), attempting to migrate away from the equator and toward the poles, or moving to higher elevations. The implications of these responses, as well as the ecosystem services expected in a given geographical location, must be anticipated and addressed to avoid chronic and catastrophic failures in these systems themselves and the human systems they support.



From the Interim Director

Wesley Jarrell, PhD

Welcome to UIUC Environmental Change Institute's second annual report. We continue to focus on bringing together the best science, economics, and policy to allow society to cope with the enormous challenges of environmental change.

Having formed through cooperation of three colleges - Agriculture, Consumer, and Environmental Sciences; Business; and Law - with our donor, the Alvin H. Baum Family Fund, we explicitly seek solutions to environmental change problems through interdisciplinary education, research, outreach, and action. Our tag line, 'Changing white papers into green solutions,' is not just a catchy phrase; it captures our drive to mobilize the incredible resources of the University of Illinois to understand and solve environmental problems.

This approach first requires a dedicated and capable team in the office.. The terrific efforts of our founding staff members, in particular Crystal Bartanen and Bill Kruidenier, must be acknowledged at this point. They have both moved on and left legacies we are trying to match. In their place Karen Decker, our Assistant to the Director, and Lori Spencer have joined ECI, and make me confident that our basic foundation is in place for dramatic and effective change.

I am particularly pleased to announce our first two ECI Fellows, Andrew Leakey and Catherine Blake. Their profiles are on the ECI website, as is their semina. ECI Fellows are expected to assist us in several ways:

- Each Fellow will schedule one or two seminar speakers throughout the year as part of ECI's seminar series. They will host the visitor and arrange the schedule.
- Each will write and submit a significant interdisciplinary research proposal that involves at least three disciplines in a novel approach to solving environmental change problems.
- They will support ECI in developing programming in their respective areas of excellence.

Join us in creating the future.

Check us out at
www.eci.illinois.edu,

and read about
our progress thus far
in the rest of this report.

Next year we plan to bring on four new Fellows with similar charges.

The state's economy and University's budget impact UIUC's ability to face and solve environmental change problems. However, with the formation of the Office of Sustainability and very active involvement of student groups like Students for Environmental Concerns and the Student Sustainability Committee, the campus is preparing to transform itself into a living laboratory of sustainability - economic, environmental, and social. Needless to say, the ECI is doing everything possible to drive that transformation.

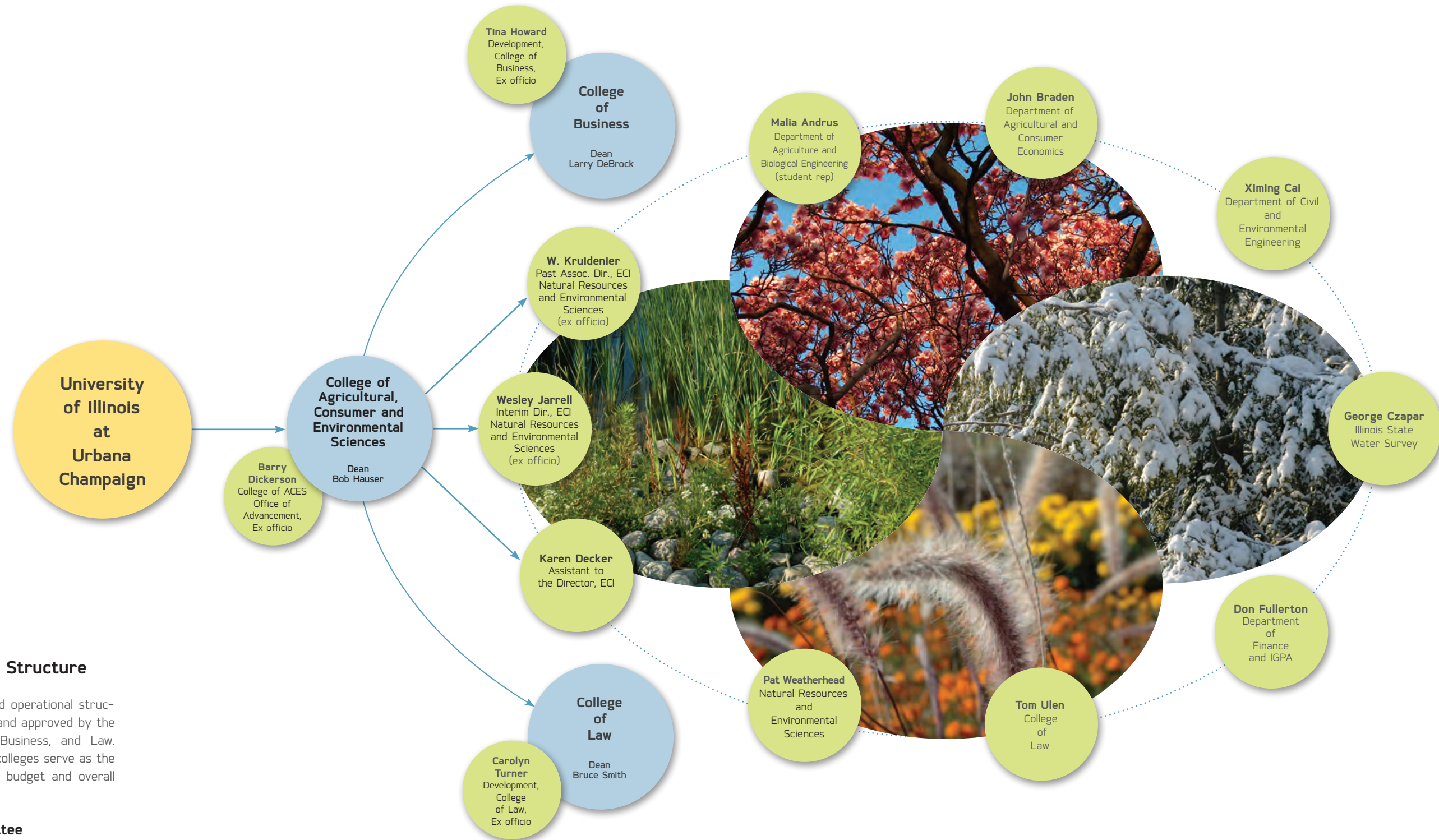
Through partnering with the Student Sustainability Committee to support new and modified courses, concepts and practical dimensions of mitigating and adapting to climate change are becoming broadly incorporated into curricula across campus, so all students are exposed to these critical issues. Our research seed grants are designed to help faculty move into new research areas with strategic funding that will have impact. Larger grants support a graduate student for one year.

By partnering with other units on campus, ECI has lent support to programs in the Humanities, Science, and professional school programs that further permeate the campus with high-level, objective discussion on the central topics of environmental change.

In the coming year, we intend to continue our efforts and expand them. Raising a permanent endowment is a major thrust for 2011, knowing that many private individuals and foundations are deeply concerned with environmental change and are looking for every possible way to mitigate change or adapt to its unpredictable aspects.

As we launch our third full year, we are excited about the atmosphere of change on campus. Change is challenge, but we know that the University of Illinois and its many partners are capable of working together to effect transformations that will create new paradigms of human and environmental well-being.

Environmental Change Institute



Administrative Structure

An administrative and operational structure was developed and approved by the Colleges of ACES, Business, and Law. Deans of the three colleges serve as the governing board for budget and overall program direction.

Executive Committee

An Executive Committee is appointed by the Director in consultation with the three college deans. Representation within the executive committee reflects the mission and domains of the Institute.

ECI delivers on its mission by funding four main categories of study:

- (1) Research,
- (2) Courses,
- (3) Fellows and
- (4) Programs.

Following is a summary of the status and outcomes of those initiatives.



Full Project Grants

U.S.-European Seed grant Collaboration on the Influence of Cultural Ecosystem Values on Agricultural Landscapes and Decision Making in the Context of Climate and Policy Change

Courtney Flint, Natural Resources and Environmental Science

How do land managers' values affect response to climate change threats?

Dr. Courtney Flint received ECI seed grant funding to initiate collaboration with European colleagues to determine how agricultural and forest landowner cultural ecosystem values influence private land management decisions in the context of and climate and policy changes. Ongoing efforts focus on synthesizing U.S. and European agricultural and climate change policy with regards to private lands, regional development, and cultural ecosystem values. In December 2010, collaborators will meet for a writing workshop in Arizona to complete an initial synthesis manuscript and prepare funding proposals for further research. Dr. Flint will travel to Europe to extend research collaboration in spring 2011.

Terrestrial carbon loss to aquatic ecosystems: pattern detection and hypothesis testing at the regional scale

Investigators: Jennifer Fraterrigo, Natural Resources and Environmental Science, Jay Lennon and Tom Frank

How much carbon is lost from forests into streams?

By combining existing data sets, namely satellite-based remote sensing imagery and long-term aquatic chemistry data from the Hudson River, we create a spatially and temporally comprehensive database of aquatic dissolved organic carbon with which to evaluate some of the key hypothesized factors that are responsible for observed changes in carbon flux between terrestrial and aquatic ecosystems. We anticipate that the results from this interdisciplinary research will help us better understand the impacts of global change drivers on carbon dynamics and ecosystem services in human-dominated landscapes.

Environmental change-induced alterations in crop rooting drive impacts on carbon and water cycling

Andrew Leakey, Plant Biology

How does plant root growth affect crop response to climate change?

Plant roots play a key role in determining ecosystem carbon and water cycling responses to environmental change. In year 1 of 3, we have used minirhizotrons to quantify the impact of elevated CO₂, temperature and drought treatments on the size and distribution of soybean and maize roots under field conditions. Ongoing image and data analysis will be used to test the hypothesis that the enhancement of root production and carbon sequestration is magnified when plants experience greater temperature and drought. If this is the case, it will force reinterpretation of how environmental change impacts the pools and fluxes of carbon and water in the Midwest U.S. agroecosystem.

The Impact of Gasoline Prices on Internet Purchases

Andrea Martens, Agriculture and Consumer Economics

Do consumers shop more on the Internet when fuel price increase?

This project analyzes how consumers adjust their behavior in response to changes in transportation costs, focusing particularly on the substitution between online and traditional purchases. This study focuses on how gas prices, cars' fuel efficiency, and distance to traditional retail establishments affect consumers' decisions to purchase online, using detailed confidential data for 155,000 households and retail gas prices at the zip code level. Preliminary results show that tax avoidance is a greater determinant of online purchases than saving transportation costs.

Funded Initiatives

ECI Student Ambassadors for Global Change Research

Principal Investigator: Lisa Ainsworth, Crop Sciences and Institute for Genomic Biology and Carl Bernacchi, Evan DeLucia, Andrew Leakey, Don Ort

How will raising CO₂ and ozone levels affect crop growth in the Midwest?

The ECI Student Ambassadors for Global Change Research program provided funding for ten undergraduate students to participate in a 12 week summer internship in 2009 and 2010 to do independent and team research and outreach for the Soybean Free Air Concentration Enrichment (SoyFACE) experiment. SoyFACE is a multi-user, international facility for the study of global climate change impacts on the largest U.S. agroecosystem. The experiment investigates soybean and maize response to rising atmospheric carbon dioxide, rising tropospheric ozone, rising temperature and decreased water availability. The program included five students from the University of Illinois, and five students from colleges and universities in Indiana, Missouri and Pennsylvania.

The Role of Local Public Policy in Building Green

Principal Investigator: Julie Cidell, Geography

Do policies change patterns of green building construction?

We examined the spatial distribution of green buildings and policies to visualize the current landscape of 'greenness'. This mapping involved compiling data regarding LEED-based green building policies at the school district, city, and state scales and examining how these policies interact. We found a significant correlation between the presence of a LEED-based policy and the number of LEED certified/registered buildings in U.S. cities. As expected, results indicate that a mandatory policy has a stronger impact than an incentive/encouraging

policy. These findings provide evidence that a city can increase the 'greenness' of its built environment by instituting mandatory LEED building standards.

Assessment of total soil carbon using advanced technologies

Investigators: Willie K. Dong, Agricultural Consumer & Environmental Science and Nick G. Glumac

How can we accountably and quickly assess soil carbon sequestration?

Soil organic carbon (SOC) analysis is necessary to evaluate the efficacy of land use and management practices that sequester soil carbon and to verify the total SOC available as a tradable commodity in carbon exchange markets. We have improved the method of laser-induced breakdown spectroscopy (LIBS) for laboratory analysis of SOC (see publication in Soil Science Society of America Journal 74(6): 2010) and are currently assessing the impact of soil density and moisture on this elegant method. These studies are critically important for ongoing development of a portable LIBS system to rapidly and accurately measure total SOC in the field on a large scale and in real-time.

Farm-level Carbon Footprint Assessment of Agricultural Production Practices

Principal Investigator: A. Bryan Endres, Agriculture and Consumer Economics, Institute for Genomic Biology, Nick Paulson, Mark Althouse, Jay Kesan

What is the carbon footprint of an individual farm?

The goal of this project was to bring the discussion of carbon economics and legal standards to agricultural producers through existing outreach networks (www.farmdoc.illinois.edu). Project outputs included an Excel-based GHG assessment tool, short articles, and presentations made available through the farmdoc website and outreach meetings.

These resources provide farmers information on how to modify their production practices to reduce GHG emissions, and introduce them to opportunities for participation in emerging carbon markets. A follow-up study has been funded by the Illinois Corn Marketing Board as a result of the progress made with this seed grant project.

The role of phosphorus in the TMDL—Total Maximum Daily Loads—process initiated for the Tualatin River

Investigator: Jennifer Nelson, Environmental Change Institute

How will climate change affect water quality regulations?

Water quality rules often assume constant climate in setting numerical quality standards. Given our expectation that average water flow patterns will change along with changing climate, we need to re-examine our assumptions about water quality rule-making. This project uses as a case study one of the first rivers to have the TMDL (Total Maximum Daily Load) section of the Clean Water Act applied across the watershed. As a result of this study, regulators and stakeholders can better understand how to adapt as flow rates change over time.

Role of Microbial Community Dynamics in Sequestration of Carbon in Soil Columns

Principal Investigators: Luis Rodriguez, Agricultural & Biological Engineering, and Angela Kent.

How does nitrogen fertilizer application affect soil carbon?

The objective of this research initiative was to characterize the interrelationships between soil bacterial communities and crop growth relative to carbon sequestration under different levels of nitrogen fertilization and soil moisture, and utilize this information to design a model simulating the dynamics of soil organic carbon (SOC). To test our



hypotheses, soil column mesocosms were utilized to generate the data required and also to develop and calibrate the SOC model. The soil column experiment is ongoing. A SOC model has been designed and several modeling approaches have been tested on data available describing related ecosystems.

Impacts of Climate Change on Coastal Marine Ecosystems

Principal Investigator: Cory Suski, Natural Resources and Environmental Sciences and David Philipp

How will climate change stress coastal marine organisms?

While the future impacts of climate change on the ocean conditions have been well documented, we currently lack an understanding of how marine biological communities will respond to these climate-induced changes to marine habitat. The objective of the study is to quantify the physiological responses of coastal marine organisms at both the individual and population levels to stressors associated with climate change. We examined how a number of different stressors impact the physiology of a range of species across different life stages and different time scales. The studies are being

carried out at the Cape Eleuthera Institute (CEI), The Bahamas, by University of Illinois faculty and graduate students, but are also providing research experience for a local high school affiliated with the research facility.

Change in the Heartland:

Lead: Michelle Wander and Project Assistant: John Marlin, Jr., Natural Resources and Environmental Sciences.

How can we develop a common vocabulary for environmental change?

Environmental change, and in particular climate change, have evolved their own vocabularies and phraseologies. For us to solve these problems, we must first speak the same language. ECI partnered with the Agroecology and Sustainable Agriculture Program (Director Dr. Michelle Wander and writer John Marlin Jr.) to create our Change in the Heartland series, which aims to bring the best objective descriptions of important issues related to climate and environmental change. UIUC professors drafted papers, which were then edited to make sure their content is accessible to the general public. Starting with sixteen initial topics, we plan to expand as need

and opportunity dictate, to provide a common vocabulary for addressing these complex and important issues.

Climate Change Impacts on Midwest Agriculture and Water Resources

Principal Investigator: Don Wuebbles, Atmospheric Sciences, School of Earth, Society, and Environment, Department of Atmospheric Sciences

Katharine Hayhoe, Momcilo Markus,

What is the effect of climate change on agriculture in the Midwest?

The goal of this project is to quantify and enhance current understanding of the potential impacts of climate change on food production and water resources in the Midwest. There are two major research reports resulting from this project, plus a special paper on "What Will the Climate be Like in 2050?" for Change and the Heartland. The first study focuses on analyzing potential impacts of climate change on agriculture in the Midwest during the 21st century, focusing primarily on the potential for impacts that will require adaptation. The second study evaluates potential flooding from storms in the Chicago region for the present and the 2050s under high and low emissions climate change scenarios.



Social Science Approaches to Environment-Society Relations

Instructor: Thomas J. Bassett, Geography

Research Assistant: Betsy Beymer-Farris

Focus Area: Environmental Change

Course Participants: Required for all Earth, Society, and Environment (SESE) majors

We have determined an organizational structure for the course outline that can be easily translated to an online course format as this course will now be offered online as well as in the classroom. We are currently enrolled in the UIUC "Online Faculty Development" course in order to acquire the skills needed to teach online, including the dynamics of creating group assignments and facilitating group work-based learning in an online environment. We will also participate in the LAS Teaching Academy "Building and Offering an Online Course." At this time (October 2010) we have selected the main course texts and have gathered the readings, videos, and news articles for each week's lectures for the first half of the course.

Sustainability and the Built Environment

Brian Deal, Urban and Regional Planning

The main objective of the course is to teach students about how to think about buildings from a different - energy and sustainability-centric, perspective. We hope to have a vertical structure that enables us to engage high level graduate to undergraduate, although there will be preference to higher level undergraduates. We are also partnering with the Ethnography in the University program to deliver data on the buildings studied - for future classes to use. And we plan a postmortem on the class to review important successes and deficiencies. Our hope is that it will evolve into a regular offering. We also are considering the online implications of such a course.

Grab-A-Bike @ Illinois

Bruce Litchfield, College of Engineering

Grab-a-Bike Illinois aims to bring a bicycle-sharing program to the Urbana-Champaign campus and community. It aims to be the first solar-powered and cost-efficient bike sharing system. Totally wireless, a terminal station can be installed anywhere - then unmounted and stored during hard winter months.

Grab-a-Bike is a section on the LINC-Learning in Community course (ENG 298/315). During spring 2010 the course partnered with the Urbana-Champaign MTD and had an enrollment of 15 students. Our goal for the spring 2011 semester is to build a working prototype and establish a sustainable organization. With Grab-a-Bike we hope to establish a successful campus and community-based bicycle sharing system while providing students real-world experience.

Sustainable Product and Market Development for Subsistence Marketplaces

Madhu Viswanathan, Business

We offer a year-long graduate-level interdisciplinary learning experience with an international immersion experience on designing sustainable products for subsistence marketplaces (BADM 532 and 533). The deliverables are workable prototypes and comprehensive business plans that address social and environmental sustainability. Our challenge is to enhance the educational content that relates to subsistence marketplaces and the environment. We are in the planning stages of developing multi-media content that capture environmental problems in urban and rural settings.



Senior Design; Building Sustainability Projects

Building Sustainability Projects for ME 470, Leads: Stephen R. Platt, Mechanical Science & Engineering and Emad W. Jassim

ME 470 is the capstone Mechanical Science and Engineering senior design course. It provides students with open-ended problem-solving experiences that require them to synthesize and apply the knowledge gained throughout their coursework by solving real-world challenges. Two student projects, one each during the Fall and Spring semesters, focus on increasing the energy efficiency of two campus buildings. The goals are to reduce energy consumption in each building by 20% while meeting a 5-year payback requirement by identifying changes that can be made to the physical plant and methods that encourage building users to act in a more sustainable fashion.

Democracy and Environment: Representation in Natural Resource Management

Course Instructor: Jesse Ribot, Beckman Institute

Description: The 4-credit, 400-level geography course, "Democracy and Environment in the Developing World: Institutionalizing Representation," will explore the two-way relation between environment and democracy. It will be cross listed with sociology and political science. Using developing-country case studies and theoretical literature the course will explore the effects of natural resource management interventions on three dimensions of local democracy: representation, citizenship, and the public domain. The course will also examine how democratic process effect environmental quality and natural resource-dependent livelihoods. The course will use environment as a lens for better understanding the building and functioning of local democracy and sustainability.

Landscapes, Sustainability, & Human Health

William Sullivan, Landscape Architecture

Landscapes, Sustainability, & Health will engage students with a broad-range of readings and exercises that will help provide them with the analytical skills, knowledge, and where-with-all to address the challenges of producing sustainable, healthy places. The course was developed during the summer of 2010 and will be taught during the spring of 2011. I expect this course will be attractive to students in a number of disciplines and will direct it to super-division undergraduate and to graduate students.

Science and Sustainability

Scott Willenbrock, Physics and Kevin Pitts

Science and Society (Phys 150) was first offered for the first time in Fall 2010. The goal of the course is to educate future citizens and world leaders in science topics that are vitally important in the modern world. Topics include conventional and alternative energy, outer space, radiation, nuclear energy, nuclear weapons, electricity and magnetism, waves, light, climate change, and quantum mechanics. The course is based on the textbook *Physics for Future Presidents* by Richard Muller; lectures, demonstrations, and course materials are being developed.

Development of a Renewable Energy Law Course

Course Instructor: Jay Kesan, Departments of Agriculture and Consumer Economics, and Business Administration

This newly created graduate level course covers a broad range of topics and issues in the field of renewable energy law and regulation. It utilizes the case study method to examine each renewable energy sector (e.g., wind, solar, geothermal, ocean/tidal, biofuels) with a focus on how law and regulation can facilitate renewable practices, facilitate the development of the specific renewable energy sector, as well as control or prevent environmental externalities in the production and consumption of energy. The course was taught for the first time in Spring 2010, and it will be taught again in Spring 2011. It is cross-listed in the College of Law and the College of Agricultural, Consumer and Environmental Sciences.

Design and Evaluation of Green Roof Systems at the University of Illinois

Course Instructor: David Kovacic, Landscape Architecture

In spring of 2009 a workshop course entitled *Green Roof Design: Old and New*, was taught in the Department of Landscape Architecture. It focused on technical design and ecosystem function of extensive and intensive green roofs; and new and retrofit technologies that could be implemented at the University of Illinois. Plans to retrofit Noble Hall (a 58-year-old building) with an intensive system and the new Cope-Kalantzis house with an extensive system were developed. In fall 2009, the graduate class LA 450 (*Ecology for Restoration, Management and Sustainability*) continued this work and produced a proposal to establish a Noble Hall green roof.



Global Warming, Biofuels and Food and Plants and Global Change

Integrated enhancement of Global Warming, Biofuels & Food and Plants & Global Change

Course Instructor: Andrew Leakey, Plant Biology and Institute for Genomic Biology

This grant supported the development of our Environmental Change biology Podcast Project. This initiative involved: (1) students in IB440 producing 20-minute podcasts on environmental change research, (2) students in IB107 reviewing publicly available podcasts and building a searchable database, and (3) development of podcasts as "required listening" to replace "required reading" in both courses.

Climate and Social Vulnerability: Concepts and Policy Approaches

Course Instructor: Jesse Ribot, Beckman Institute

Thanks to the ECI course development grant, "Climate and Social Vulnerability: Concepts and Policy Approaches" has been developed and approved as a 400 level course in Geography, Sociology, Planning and Atmospheric Sciences. The course explores: 1) causes of climate-related stress and disaster; 2) theories of vulnerability and adaptation; 3) practices and policies designed to reduce economic loss, hunger, famine and

dislocation in the face of climate trends and events. It draws on case examples primarily from the developing world and will provide students with a theoretical base and policy-analytic skills applicable to increasing security and wellbeing of the poor.

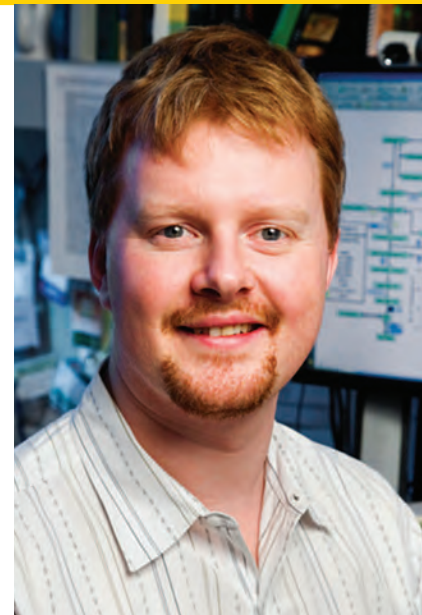
Environmental Sustainability - A Global Perspective

Course Instructor: William Sullivan, Landscape Architecture

A Global Perspective explores the challenge of creating a sustainable world. We engage this topic by examining: a) trends and conditions of the earth's major ecosystems, b) ways in which our economic system has created levels of consumption that threaten sustainability, c) the extent to which equity and justice contribute to sustainable systems, and d) evidence demonstrating how human creativity and innovation can create a more sustainable world.

The course has been taught three times: during Fall 2009 with eleven students; in Fall 2010 with 27 students from eight different academic departments, and currently, as part of LAS online to six students. The goal is to increase enrollment to 60 students.

One of our central goals is to help develop the next generation of problem-solvers who will address all issues surrounding environmental change. We have established the Fellows Program to bring top faculty on the University of Illinois Urbana-Champaign campus into our programs and assist them with their work. Using their \$10,000 annual stipend, the Fellows are developing an ECI seminar series, submitting at least one large interdisciplinary research proposal, and assisting in ECI program development in their respective areas of expertise. In 2010 we are proud to present our first two Fellows, Catherine Blake and Andrew Leakey; read about them and their programs below.



Catherine Blake, Ph.D.

Associate Professor, Graduate School of Library and Information Sciences

Co-Investigators:

Ila Cota, University of Colorado at Denver and Carole Palmer, Graduate School of Library and Information Sciences, University of Illinois Urbana-Champaign

Text Mining Environmental Change Literature

Research questions related to environmental change are complex, global, and dynamic. Although scientists and policy makers can access more electronic information than at any other time in history, the limiting factor in identifying feasible remedies is that the quantity of information exceeds our human cognitive processing capacity.

Our goal is to develop text mining methods that support information synthesis and discovery. Both of these activities are difficult - even for people; thus, we propose a socio-technical strategy that considers both the manual processes used by environmental researchers to resolve contradictory and redundant evidence and automated processes that accurately identify concepts, relationships, and paraphrasing, and that generate multi-document summaries.

Andrew Leakey, Ph.D.

Assistant Professor, Department of Plant Biology

Co-Investigators:

Carl J. Bernacchi, USDA Agricultural Research Service and Shaobing Peng, International Rice Research Service

Collaborator:

Bruce Kimball, Research Consultant

Basic Research to Enable Adaptations of Rice Production to Rising Temperature

This research project will address the challenge of developing improved rice germplasm that tolerates high temperatures by uniquely combining an integrated genomic, biochemical, physiological and agronomic analysis of rice responses to elevated temperature with a state-of-the-art facility allowing experimentation under field conditions in a tropical growing area. This will generate important new information on the mechanism of rice sensitivity and tolerance to elevated temperature and identify genes and processes as targets for crop improvement.

ECI Fellow Seminar series

November 29, 2010, 10:00 a.m., The Monsanto Room, ACES Library Dr. Catherine Blake, ECI Fellow, welcomes Dr. Ron Dembo, the Founder and CEO of Zerofootprint, a socially responsible enterprise whose mission is to apply technology, design and risk management to the massive reduction of our environmental footprint.

March 2, 2011, 12:00 p.m., Dr. Andrew Leakey, ECI Fellow, welcomes Professor Russell Monson from the Department of Ecology and Evolutionary Biology, University of Colorado Honors - Fulbright, von Humboldt and Guggenheim fellowships Editor-in-Chief of *Oecologia* Author of over 150 journal papers. Specialist in plant emission of volatile organic compounds, C4 photosynthesis, forest water and carbon cycling.

April 20, 2011, 12:00 p.m., Dr. Andrew Leakey welcomes Professor Keith Mott from the Department of Biology, Utah State University Editor-in-Chief of *Plant, Cell & Environment*. Author of over 60 journal papers, Specialist in plant stomatal function

TBD, Dr. Catherine Blake welcomes Ila Cote, PhD, DABT the Senior Science Advisor from the Immediate Office of the Director at the U.S. Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC

The Integrated Sustainable Homestead

Wesley M. Jarrell and Matthew Luedtke, Environmental Change Institute

This project addresses the question: "How effective are small-scale solutions in enhancing food production, energy, and water management?"

Solutions to environmental change come in all sizes, from megawatt power plant projects to small-scale energy-conserving lighting and backyard food production. To provide students with firsthand experience in small-scale food, energy, and water-related solutions to environmental change, ECI has supported the development of a 45 acre tract of land at the urban-rural interface, on Windsor Road west of First Street. Major features include a pond, a barn and corn crib suitable for restoration, agricultural land and restored prairie. With students participating in demonstration and research projects, and educational projects, the next generation of scientists, citizens, and problem-solvers will have a place to practically apply theory, near their classrooms.

Mumford House

The Mumford House is the oldest building on campus, constructed as a model farmhouse in the 1870s. ECI supported Associate Professor Paul Kapp, (Architecture) in developing a "deep green" remodel of the house that would make it a 21st century model of energy and water use efficiency, as well as highly livable. These plans are available for review.

Dixon Springs Sustainability Fair

How do you envision sustainability? The staff at DSAC in Southern Illinois, led by the Resource Conservation and Development Council, assembled many players in energy, environment, water use, and land use to provide practical examples of how you go about living sustainably in today's world, as well as pointing toward the future. ECI co-sponsored the two-day event in early October, which brought together participants from many communities across southern Illinois, Kentucky, and Missouri.



Illinois Program for Research in the Humanities (IPRH)

To meet our goals at ECI we can't restrict our efforts only to the material elements of our issues; we must also consider the human social dimensions. By supporting the seminar series on Climate Change, we have broadened our scope and helped ensure that the solutions we provide will include the humanities dimension as well as engineering, science, and social sciences.

Earth Week. Agroecology and Sustainable Agriculture

As part of the Earth Week observance on campus, we supported Patricia Allen's visit. Dr. Allen has been involved in organic and alternative agriculture at UC Santa Cruz for three decades, and brought a wealth of experience and insight to campus during her visit on aspects of sustainable organic agriculture, many of which have direct application to environmental change.

Student Sustainability Committee

This year ECI collaborated with the SSC to support the development of new courses. We plan to expand this collaboration in future years to help coordinate our resources for the best and most effective possible results.

Illinois in Washington

Dr. Don Fullerton, College of Business and member of ECI's Executive Committee, co-organized a program with University of Chicago and Resources for the Future to inform legislative staff members of important relevant issues to climate change. Ten papers have been submitted for a special issue of the

Journal of Economic Analysis and Policy. This event helped ECI meet its goal of bringing the best quality facts to decision-makers at all levels of government.

The Center for Global Studies

While many of ECI's projects focus nationally and regionally, the climate change problems we face are ultimately global and need to be addressed appropriately. We have partnered with the University of Illinois Urbana-Champaign's Center for Global Studies (CGS) to support course development that meets the common goals of both units, educating a new generation of problem-solvers within a global context. This exciting jointly-funded program will continue for at least four years, with CGS's support from the Department of Education connecting with ECI's private and university funding.

Walking the Walk

Ten faculty, staff and students comprise the ECI. Following are steps we take to lighten our own individual carbon footprints every day. Many of us bike or take the bus to work, others walk. Several team members make this a year-round practice. A few of us drive hybrid cars. We are avid gardeners, composters, mulchers, and recyclers of plastic, paper, and cans. Many of us raise enough vegetables to feed our family or roommates, all growing season long. Wherever possible we buy at local farmers' markets. Everyone at ECI is sensitized to avoid excess heating, cooling and lighting. We keep our thermostats between 60° and 65° except in summer, and one member heats his home by an ultra-efficient wood burning stove. We've switched light bulbs to compact fluorescents and think of water from the tap as if it were priceless. Individually, these are all small steps, but we think they're worth it.



Wes Jarrell Bill Kruidenier Matt Luedtke Rob Kanter Lori Spencer Karen Decker Willie Dong Eric Jackson

Revenue

Baum Family Fund	300,000
University of Illinois	120,000
Students for Environmental Concerns	(supported course development) 26,210

Total Revenue 446,210

Expenses

Staffing	203,000
Research Grants	74,725
Education, (Course, Symposia)	66,000
Fellows Program	20,000
Operations	75,000

Total Expenses 438,725