GLISA

GREAT LAKES INTEGRATED SCIENCES + ASSESSMENTS

April 2011 Progress Report

1. **Award Title:** Great Lakes Regional Integrated Sciences and Assessments Center

2. **Performance Period**: September 1, 2010 through April 30, 2011

3. **Team Members**

Co-Directors
Don Scavia, University of Michigan
Thomas Dietz, Michigan State University

Core Team
Jeffrey Andresen, Michigan State University
Ken Frank, Michigan State University
Melinda Huntley, Ohio Sea Grant
Maria Carmen Lemos, University of Michigan
Chuck Pistis, Michigan Sea Grant
Richard Rood, University of Michigan
Marilyn Thelen, Michigan State University Extension
Julie Winkler, Michigan State University

Staff
David Bidwell, GLISA Program Manager
Laura Briley, University of Michigan

Supported Graduate Students
Rene Henry, University of Michigan (Fall 2010)
Scott Kalafatis, University of Michigan (Winter 2011)
Lisa Kenney, Michigan State University (Fall 2010-Winter 2011)
Evan Oswald, University of Michigan (Winter 2011)
Vijay Ramparasad, University of Michigan (Fall 2010)

4. **Current Areas of Focus**

GLISA has focused its initial work on three sectors critical to the economy and quality of life in the Great Lakes Basin: agriculture, water management, and natural resources-based recreation and tourism. Through strategic partnerships, GLISA is also engaged in assessment of climate vulnerability and adaptation needs for cities within the basin. Our small grants program allows us to address targeted issues of regional importance, such as human health.

5. Main Stakeholders & Partners

Because GLISA is a new organization, we have just begun to interact with stakeholders on specific initiatives and projects. We have, however, given considerable thought to how we will interact with different types of constituencies within the Great Lakes region. We include a brief introduction to each category and examples of how our team is interacting with these stakeholders. We note that this assessment is based on many years of intensive and extensive interaction with stakeholders in each category by the GLISA team via their ongoing assessment work and will be supplemented by a formal network analysis that is in progress.

Practitioners

GLISA provides information and guidance to decision makers who are directly impacted by climate change and variability, and to the institutions that provide support for these decision makers. Through our efforts to assess downscaled climate data for the region and provide decision makers effective access to this data, we have been working directly with planners from the City of Ann Arbor, Michigan; program staff from ICLEI—Local Governments for Sustainability who are working with the municipality of Grand Rapids, Michigan; and the Huron River Watershed Council, which is about to embark on a project to engage diverse resource managers from the watershed in a climate assessment.

Policy Actors

Policy actors are individuals who are involved in making public policy. Naturally, this group includes elected officials, but it also includes their appointees and staff, as well as senior staff of government agencies. Moreover, senior and key program staff from nongovernmental agencies also plays a significant role in policy processes. GLISA interacts with policy elites through its Stakeholder Advisory Committee, which includes leadership from relevant agencies and organizations in Michigan, Ohio, and Ontario. Moreover, GLISA team members are in active discussion with emerging government and NGO collaborative networks in the region (see below).

Climate Adaptation Community

Within the Great Lakes region, there are numerous individuals and institutions working directly on issues related to climate change and variability. We believe it is important that GLISA and its team members play an active role in this community. At the national and global level, members of our team have been engaged in workshops for the National Climate Assessment and played significant roles in planning for the NOAA climate projections center. Moreover, critical members of the North American community participate in our Science Advisory Committee. At the regional and local levels, GLISA has played a significant role in the formation of a Michigan Climate Coalition (http://www.espp.msu.edu/climatechange/michigan_climate_coalition.php/). GLISA is a strong partner in the U-M Graham Institute's Great Lakes Cities Climate Adaptation Integrated Assessment project focused on mid-sized urban environments. We also participate in regular calls of NOAA's Great Lakes Climate Working Group and the steering committee for the Coastal Habitat Conservation in a Changing Climate workshop in the Great Lakes region.

Researchers

Researchers from outside the GLISA team have a significant stake in the GLISA's work. In this initial phase of our Center, we have made efforts to participate in relevant professional conferences and introduce GLISA to the research community. In this first year, we also conducted our first grant competition, which attracted applicants from universities and nongovernmental organizations. One of the goals of this competition is to build awareness of GLISA within the Great Lakes research community. Finally we have engaged in a collaboration with researchers from other RISAs (WWA and CISA), described in more detail below.

6. **Research Findings**

No research projects have been completed at this time. Preliminary results are reported in the section below on Projects In-Progress.

7. ACCOMPLISHMENTS

In addition to establishing our advisory committees and conducting our first funding competition, GLISA has made substantial progress in its assessment of stakeholder networks and downscaled climate data. Those projects are ongoing and are discussed in the Projects In-Progress section below.

Advisory Committees

An important goal for GLISA's first year was convening advisory committees. These committees serve three purposes: 1) connecting the GLISA to critical national and regional networks; 2) helping GLISA set priorities for future research and funding; and 3) evaluating GLISA programs. Although the committees will frequently function as a single entity, the two committees serve slightly different roles. The Science Advisory Committee is comprised of experts that are well-respected within the national or international climate community. Stakeholder Advisory Committee members represent critical interests found within the initial geographical focus of GLISA, the watersheds of Lakes Huron and Erie.

Science Advisory Committee

David Behar	Water Utility Climate Alliance
Patrick Doran	The Nature Conservancy
Baruch Fischhoff	Carnegie-Mellon University
Linda Mortsch	Environment Canada
Susanne Moser	Susanne Moser Research and Consulting
Richard Moss	Pacific Northwest National Laboratory
Terry Root	Stanford University

Stakeholder Advisory Committee

Patty Birkholz	Michigan Office of the Great Lakes
Andy Buchsbaum	National Wildlife Federation
Amir Eylon	Ohio Tourism Division
Ed Hammett	Ohio Lake Erie Commission
George Kuper	Council of Great Lakes Industries
Dennis McGrath	The Nature Conservancy--Michigan
John Nordgren	Kresge Foundation

Kathleen O'Neill	Ontario Regional Adaptation Collaboration
Steve Shine	Michigan Department of Agriculture and Rural Development
Guy Williams	G.O. Williams and Associates

Grants Competition

A central component of the GLISA organization is a flexible research-funding program. In December 2010, GLISA released a call for letters of interest in one-year Great Lakes Climate Assessment grants to support activities that identify potential impacts, responses, vulnerabilities, opportunities, and barriers to adaptation to climate change and vulnerability in the Great Lakes region. GLISA received 20 letters of interest and invited 9 teams to submit full proposals. While research topics were not limited, special attention was given to projects related to GLISA's initial primary sectors—agriculture, water management, and natural resource-based tourism and recreation. Proposals were required to describe processes that would be used to engage relevant decision makers in the research process. Following a review by an ad-hoc committee of experts in climate issues and integrated assessments, 5 proposals were selected to receive grants up to $30,000 per project.

Principal Investigator	**Project Title**
Lenters (Nebraska)	Assessing the impacts of climate variability and change on Great Lakes evaporation
Lynch (MSU)	Designing a decision support system for harvest management of Great Lakes Lake Whitefish in a changing climate
Nicholls (MSU)	An assessment of the implications of climate variability and change for Michigan's tourism industry
Hyndman (MSU)	Predicting the impacts of climate change on agricultural yields and water resources in the Maumee River Watershed
Schmitt-Olabisi (MSU)	A modeling framework for informing decision maker response to extreme heat events in Michigan under climate change

Grant recipients will produce a five to ten-page white paper evaluating the current state of knowledge on the adaptation issue under investigation, and identifying the outstanding information needs of decision makers. When completed, white papers will be posted on the GLISA website and we expect these white papers will make a significant contribution to the ongoing National Climate Assessment. Research teams will also present an introduction to their research as the GLISA annual meeting (scheduled for November 2011).

8. **PROJECTS IN-PROGRESS**

Four major projects are in progress at GLISA. These are 1) building a comprehensive stakeholder-driven database based on the analysis of past assessment reports; 2) an analysis of stakeholder networks; 3) an assessment of existing downscaled data for the region and opportunities to make these data available to decision makers; and 4) a review of climate change effects and impacts in the Great Lakes region.

Integrating Knowledge and Decision-making in the Great Lakes Region: building a database of stakeholders and decisions

PI: Maria Carmen Lemos; postdoctoral fellow Youngmi Lee

GLISA researchers are conducting an analysis of existing documents focused on climate impact and responses in the Great Lakes region. Our researchers have used these documents to build a comprehensive database of stakeholder characteristics and needs across the whole region and to develop a scientific framework to analyze variables of interest including: a) characteristics of stakeholders currently engaged, including information about what organizations they belong to, at what scale and in what sector; b) the evolution and scope of stakeholders' thinking, engagement, and perception of climate knowledge needs in the Great Lakes region; c) the existence and configuration of existing stakeholder networks; d) the character and scope of actual actions and interventions to mitigate and adapt to climate impacts; e) kind and scope of knowledge needs (e.g. accuracy/level of uncertainty, spatial distribution in different sectors), patterns of knowledge production, access and uptake; and f) levels of interaction with scientists, participation in networks, and characterization of needs across scale and sectors. Such knowledge is vital not only to inform our future assessment research, but also to increase the effectiveness of science-policy networks in informing decision-making in the Great Lakes region. One important goal this study is to develop a comparative analytical framework that can be used across RISAs. For that, GLISA is collaborating with the Western Water Assessment and the Carolinas Integrated Sciences and Assessments in the design and implementation of this framework.

Data collection and organization have been carried out in three phases. First, through web-based searches, key informant and academic contacts, and library searches, we identified and collected 70 documents and reports focusing on climate knowledge needs in the Great Lakes region. Then, in collaboration with our partner RISAs, we developed a common coding guide book focusing on activities being undertaken to address issues associated with climate change mitigation and adaptation, existing stakeholder needs for responding to climate change, trusted sources of information, perceived constraints and opportunities, and how the perceptions of these topics have evolved over time. Next, we organized the database in qualitative data analysis software for further analysis. Finally, we identified stakeholders and their characteristics, including sector, area of focus and affiliation, to identify and map the social networks associated with the creation of documents and participation in key events that have produced and disseminated climate information.

Preliminary findings suggest that assessments are often focused on either adaptation or mitigation, but not both, and are further fragmented by the interests of specific sectors. For example, the shipping industry is primarily concerned with adapting to fluctuating (lowering)

water levels in the Great Lakes and expresses informational needs directly relating to this issue, such as the need to understand the short-term impacts of climate variability, improving real time communication with captains about water depths, and recommending dredging channels and ports deeper and extending the shipping season by utilizing existing icebreakers. Meanwhile those interested in the agricultural sector emphasize the need for regional and small-scale climate assessments in order to obtain a better understanding of appropriate adaptation measures that will address impacts of climate variability now and in the future.

Commonalities across sectors have also been found, some of which include information gaps, difficulty managing uncertainty (the role of the media "sensationalizing" climate change), the complicated management structure of the Great Lakes (lack of formal institutional structures), and adaptation needs and recommendations. Additionally, action is largely driven by context. Whether or not action is being taken in a region is largely dependent on whether neighboring regions are taking action. Smaller entities are waiting for guidance from other, usually larger, entities whether through example or incentives before utilizing climate knowledge to develop policy.

Great Lakes Climate Change Stakeholder Participation in Policy Events and Documents: An Analysis of Two-mode networks
PIs: Kenneth Frank; Maria Carmen Lemos; postdoctoral fellow Youngmi Lee

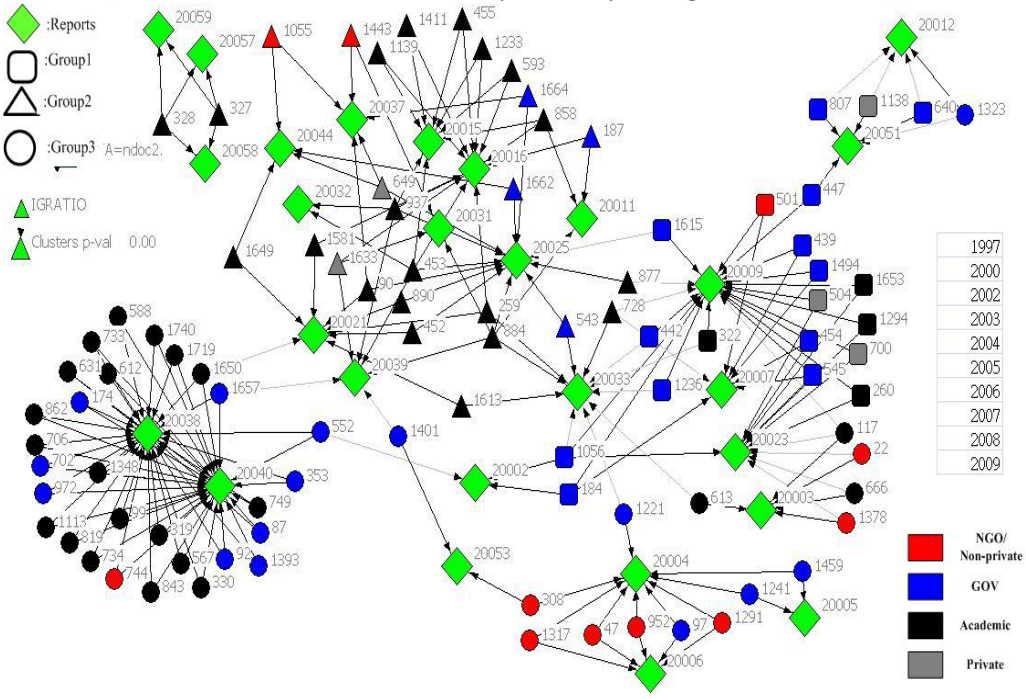
Recent work on knowledge formation and climate change suggests that the ideas one holds to be true are influenced by the group of people with whom one interacts. This study explores how stakeholders in the Great Lakes access environmental knowledge in their networks and how that knowledge affects their decision-making.

Networks are defined, in part, through participation in common knowledge-building experiences such as public policy conferences and the writing of public documents. We employ two-mode network analyses to identify clusters of stakeholders who participate in similar sets of events. We map the interactions between actor roles (scientist, policy makers, government agencies) and the focal experiences for knowledge formation (public policy events and documents) to understand how participants form their knowledge about climate change and cooperate with other scientists, governmental/ non-governmental agencies, local/ international policy makers (figure 1).

Preliminary results indicate that government agencies and academics co-participate in events, but the two groups wrote papers separately. Furthermore, different groups of stakeholders emerged at different points in time, focused around the writing of specific reports. This suggests that government agents and academics are exposed to similar knowledge bases, but construct knowledge through different experiences. We also found evidence that regionally focused organizations participate in different events than national and state agencies, suggesting they access different forms of knowledge. While the networks have been earlier dominated by academics and public officials, it has increasingly diversified through time.

A major goal of the ongoing work is to examine the dynamics of these networks and in particular how events and public documents influence network structure. The results of this work will inform our communication and engagement strategies by insuring we do not miss key sub-networks in those efforts. It will also allow us to better design events and activities to enhance network connectivity including strategies for bringing new groups into the existing network and strengthening ties where they are limited.

Figure 1: Example of a stakeholder network diagram, showing how participants (color-coded to sector) cluster around the creation of specific reports (green diamonds).



Assessing Downscaled Climate Data and Making these Data Available to Decision Makers in the Great Lakes Region
PI: Richard Rood

Rather than developing a specific Great Lakes downscaled climate data product, the GLISA downscaling project evaluates the usability of existing and emerging downscaled climate projections in applications posed by stakeholders in the Great Lakes region. There are numerous downscaled products that have been developed for regional climate applications in the United States and many important efforts to provide improved products are underway. Evaluation of these products prior to any development of additional products focused on our region is good scientific and management practice. There are two guiding principles in our approach: 1) how good is this information?, and 2) how can we best facilitate access and use of this information?

Our initial activities were to identify basic resources, capabilities, and a small group of users to help define our research and development path. From these early activities and participation in stakeholder meetings, we determined that two types of information are

needed by decision makers. First, there is broad agreement on the need for qualitative descriptions of how the climate has changed, how it will change in the future, and what will be the likely relevant impacts. These qualitative analyses would include a description of the uncertainties and how the uncertainties affect particular applications. Second, there are needs for diverse types of digital downscaled climate data. Needs range from seasonal information and changes in weather extremes to a desire for daily digital data and for information like heating and cooling degree days that aggregate across weather data.

We are working to develop a cyber-infrastructure to facilitate collaborative qualitative analysis. To help design such an environment, we have broken down problem solving into four steps of information management: inventory, analysis, evaluation, and synthesis. We are currently focused on implementing a search and categorization tool that will allow members of the team and collaborators to not only contribute to the acquisition of information for inventory, but also to describe that information in terms of its usability in class of problems. Through this environment, we will expose our community of problem solvers to each other, thereby allowing them to benefit from each other's experiences, and hence, accelerate knowledge-based problem solving. We plan to use proven open-source collaborative tools adapted to our needs.

With regard to use of digital information from climate projections, an early conclusion is that many of the users of downscaled data work with Geographical Information Systems (GIS). Therefore, one task being undertaken by GLISA is the development of GIS tools that extract data from existing climate data formats and then tailor that data for applications. This task is called openclimateGIS. This effort is committed to use open-source protocols, standard interfaces, and the standards and specifications of the Open Geospatial Consortium. This work is tightly integrated with the USGS Center for Integrated Data Analytics in Wisconsin.

White Paper on Climate Science for Great Lakes Climate Change Science and Education Systemic Network
PI: Don Scavia

The Great Lakes Climate Change Science and Education Systemic Network project is funded by the National Science Foundation as a Climate Change Education Partnership (CCEP). The current partners include Eastern Michigan University, NOAA's Great Lakes Environmental Research Lab, University of Michigan, Michigan State University, Ashland University, the Ann Arbor Hands-On Museum, and the College of Exploration. The goal of the project is to take a comprehensive, regional focus linking the education, learning science, and climate science communities. This CCEP is developing a plan that is responsive to Great Lakes stakeholder needs and which takes advantage of educational efforts going on within the Great Lakes region.

GLISA researchers are developing a white paper that will describe the current scientific understanding of climate change and its anticipated impacts in the Great Lakes region. This white paper will serve as the focal point for upcoming focus groups with educators and climate scientists from the region. As part of this work, GLISA has developed an extensive database of peer-reviewed and other literature on climate change in the Great Lakes region.

This database will be available via our website making it a "one-stop" source for useful literature.

9. Communicating or Translating Science to Decision Makers

GLISA is committed to building the network of decision makers concerned with climate change and variability. Members of the core team have provided talks at several private and public events. Key interactions with decision makers are highlighted below:

- Several team members participated in a kickoff meeting for the U-M Graham Institute's Great Lakes Cities Climate Adaptation Integrated Assessment.
- Team members participated in a two-day training event on climate change and variability for Michigan State University Extension.
- A GLISA team member has been actively engaged in the early phases of a Michigan Climate Coalition. This coalition involves representatives of state agencies, businesses, and nongovernmental organizations from across the state.
- Members of the GLISA team attended the 2011 Climate Prediction Applications Science (CPAS) Workshop, provided a presentation about GLISA, and participated in expert panels.
- Announcements of the funding of GLISA, released by its host universities and NOAA, generated several news stories and interviews on regional public radio stations.
- GLISA members gave public presentations of the impacts of climate change and variability in the Great Lakes region.

10. Publications

Dietz, T. and **D. Bidwell**. 2011. *Climate Change in the Great Lakes Region: Navigating an Uncertain Future.* East Lansing: Michigan State University Press. In press.

McKenney, D.W., J.H. Pedlar, **R.B. Rood**, and D. Prince. 2011. Revisiting projected shifts in the climate envelopes of North American trees using updated general circulation models. *Global Change Biology*. Published online March 22, 2011. http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2011.02413.x/abstract

Winkler, J.A., G.S. Guentchev, Perdinan, P.-N. Tan, S. Zhong, and M. Liszewska. Climate scenario development and applications for local/regional climate change impact assessments: An overview for the non-climate scientist. Part I: Scenario development using downscaling methods. *Geography Compass,* in press.

Winkler, J.A., G.S. Guentchev, M. Liszewska, Perdinan, P.-N. Tan. Climate scenario development and applications for local/regional climate change impact assessments: An overview for the non-climate scientist. Part II: Considerations when using climate change scenarios. *Geography Compass,* in press.

11. **Links with other NOAA Programs**

GLISA has tight links to NOAA through extensive connections of individual core team members and via the location of our offices in Ann Arbor, Michigan. Highlights include:

- Regular communication with the leadership and staff of Michigan Sea Grant

- Partnerships and communication with researchers and communications specialists at the Great Lakes Environmental Research Laboratory
- Participation in regular conference calls with the Great Lakes Regional Team Climate Working Group
- Membership on the steering committee for the upcoming workshop, Coastal Habitat Conservation in a Changing Climate: Strategies and Tools for the Great Lakes Region
- Extensive participation of GLISA team members in the NOAA Climate Projection Project
- Coordination with the National Climate Data Center.
- Communication and coordination with Doug Kluck, director of the Regional Climate Service office for the central U.S.
- Regular participation in conference calls and workshops for the National Climate Assessment

12. Cross-RISA Activities

GLISA core team members have interacted extensively with members of other RISAs, particularly through RISA Program meetings and National Climate Assessment workshops. In addition, GLISA is engaged in more formal interactions with other RISA programs.

- GLISA social scientists have collaborated with their counterparts at the Carolinas Integrated Sciences and Assessments (CISA) and Western Water Assessment (WWA) on research regarding stakeholder databases, networks and needs.
- Through the NOAA Climate Projection Pilot, GLISA researchers have worked closely with members of WWA.
- Members of the GLISA core team met with a representative of the Southeast Climate Consortium (SECC) to discuss potential opportunities for collaboration regarding agricultural data needs and decision making.