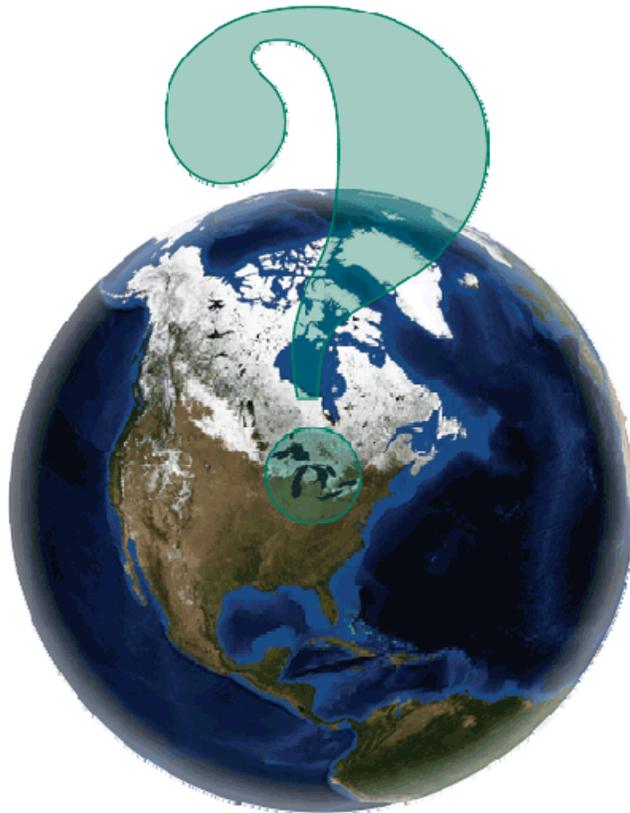


# **CLIMATE CHANGE IN THE GREAT LAKES REGION: DECISION MAKING UNDER UNCERTAINTY**

**KEY MESSAGES FROM THE “Climate Change in the Great Lakes Region”  
Conference (April 2008)**

And

**The International Symposium, “Climate Change in the Great Lakes Region:  
Decision Making Under Uncertainty” (March 2007)**

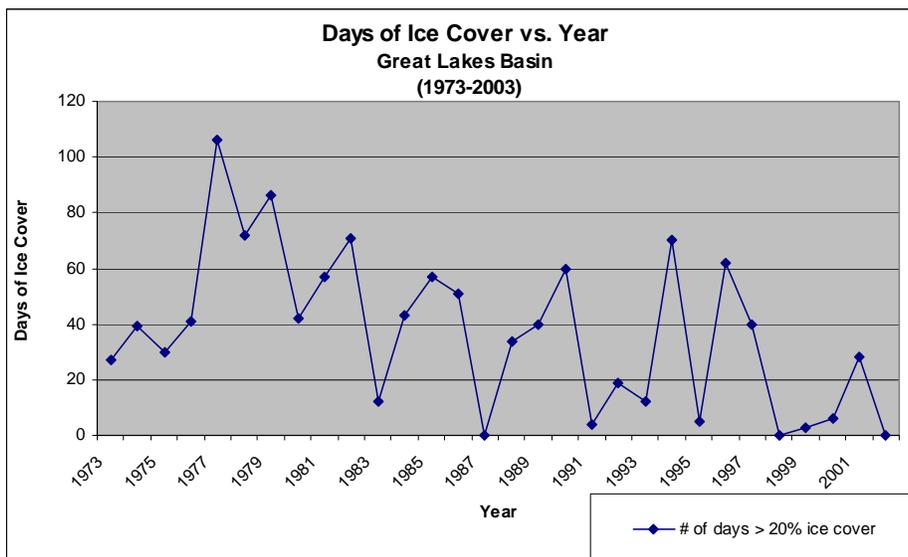


The Great Lakes Region is already experiencing a changing climate, and even the most optimistic climate models suggest further changes are coming. We must mitigate our impact on the climate to avoid the worst consequences; however, we must also adapt to the impacts that climate change will have on our economy, lifestyles, health, infrastructure and environment. Planning for climate change is complicated by substantial uncertainties about how weather patterns will shift at local scales and how those differences will influence ecological and social systems.

The Environmental Science and Policy Program (ESPP) of Michigan State University is committed to fostering information exchange and discussion about climate change among diverse stakeholders in the Great Lakes Region. In April 2008, more than 160 individuals representing academia, business, nonprofits, and government attended an ESPP-hosted conference on the MSU campus. The twelve sessions addressed topics from the effects of climate change on biodiversity conservation to the response of the business community to climate issues. This conference built upon an international symposium hosted by ESPP in March 2007. Attended by more than 200 individuals, the symposium featured presentations by twelve respected experts on climate change and how people make decisions under conditions of uncertainty. Both events engaged speakers and attendees in discussions about key messages regarding climate change in the Great Lakes Region, which we have summarized in this document. We hope these key messages can continue to shape a productive dialogue on how the region will address the challenges of climate change.

### Effects of Climate Change in the Great Lakes Region

- ◆ **The Great Lakes Region is feeling the effects of climate change.** There is meteorological and biological evidence that climate change is occurring in the Great Lakes Region. This evidence includes changed precipitation patterns, reduced freezing of the Great Lakes, and shifted distributions of many species.
- ◆ **More change is coming.** Models indicate that even under the most aggressive mitigation scenarios (i.e., we sharply reduce emissions of climate-changing greenhouse gases), our climate will continue to change in the coming decades.



The number of days in which the Great Lakes are covered by ice has declined, which has major impacts on Great Lakes levels and regional precipitation patterns. (NOAA Great Lakes Environmental Research Laboratory 2003)

- ◆ **Effects are not certain.** Agriculture, tourism, public health, fisheries and many other aspects of life in the Great Lakes Region are affected by weather patterns and climate. Changes in climate may have wide-ranging consequences on physical, biological, social and economic systems. However, the exact effects of climate change are uncertain. Our ability to predict the effects of climate change decreases as we consider longer time frames or smaller geographic scopes. Moreover, because these systems are complex, some of their responses to climate change will be surprising and could be very rapid.
- ◆ **There will be direct and indirect effects.** Some effects will stem directly from changes in the climate and weather patterns in the Great Lakes Region. Other effects will result from pressures exerted by people from outside the region. These indirect effects could include greater demand for Great Lakes water resources or increased development pressure as people migrate to cooler regions in the North.
- ◆ **Effects will not be experienced equally.** There may be both costs and benefits associated with climate change in the Great Lakes Region, but these effects will not be distributed evenly. Some areas will experience greater changes than others. Moreover, some systems, species, and individuals are more vulnerable to changes in the climate, while others are more resilient.
- ◆ **Adaptation is necessary.** Therefore, we must prepare to cope with these changes through *adaptation*. Under conditions of uncertainty, increasing the resilience of particularly vulnerable systems may provide some protection against serious climate-related problems.

### Uncertainty and Climate-Related Decisions

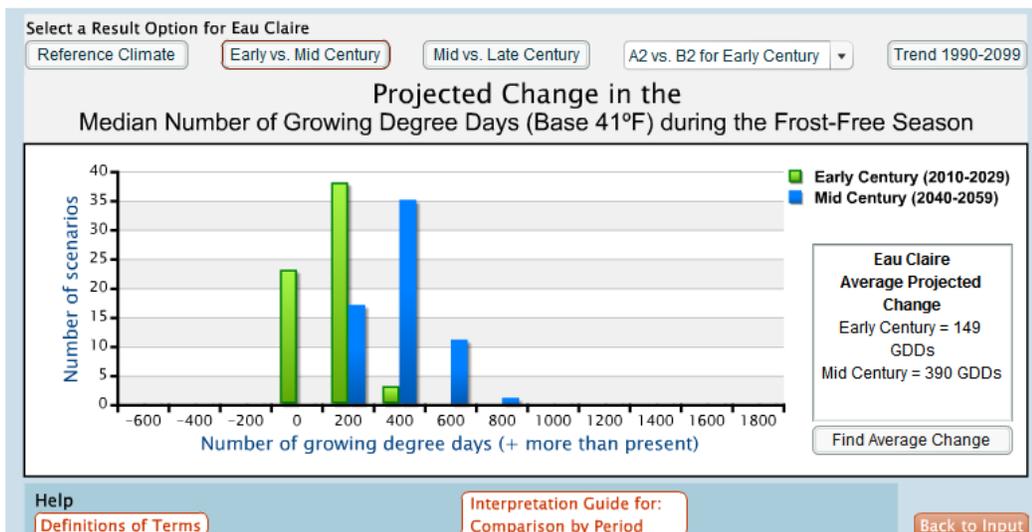
- ◆ **Uncertainty is common.** Decision makers already confront substantial uncertainty from a variety of sources. Climate-vulnerable systems already face difficult-to-predict variability in the weather. Over time, economic and social systems also change in unforeseen ways due to politics, demographic trends, fads and fashion, and technological advances. Some sectors have developed successful strategies to cope with uncertainty (e.g., insurance).
- ◆ **Uncertainty is interactive.** The uncertainties in one system may make it more difficult to predict changes in another system. The resilience or vulnerability of a particular social or ecological system to climate change depends, in part, on changes in non-climate-related aspects of the system. For example, the vulnerability of farmers depends on the types of crops they grow, and their choice of crops is influenced by markets, which are affected by food trends.
- ◆ **Uncertainty is just one obstacle to adaptation.** There are many potential constraints to planning and implementing responses to climate change. These obstacles include a lack of resources to make necessary changes, poor institutional support, or the need to attend to other priorities.
- ◆ **Uncertainty is not an excuse for inaction.** While ongoing research can resolve some uncertainties, there will always be some unknowns regarding climate. Immediate action is necessary to mitigate possible causes of climate change, prepare for potential effects, and improve the resilience of vulnerable systems.

## Research Needs

- ◆ **Foster creativity.** A wide variety of research is needed to better understand potential effects of a shifting climate and the best ways to address these effects. Research and development will result in new technologies that reduce human impacts on climate and prepare us for coming effects. Rather than focusing on preordained solutions to climate change, research funds should encourage researchers to create and explore novel approaches.
- ◆ **Technical information isn't everything.** While scientific information is critical to analytic decision processes, climate-related decisions will also involve affective and heuristic strategies of risk management. Research is needed to better understand the variable ways in which decision makers currently make climate-related decisions and respond to changing environmental conditions.
- ◆ **Encourage interdisciplinary scholarship.** Because climate, ecological and social systems are complex, the most successful climate-related research projects will integrate knowledge and expertise from across disciplines.
- ◆ **Integrate diverse voices and forms of knowledge.** Naturally, scientific expertise is critical to understanding climate change and developing solutions. However, traditional forms of knowledge are also vital to fully understand how ecological and social systems are affected and can respond to changes. Sources of traditional knowledge include Native American Tribes, farmers and other stewards of land and water in the region.
- ◆ **Break barriers of communication.** Scientific models and data can be useful in decision making if they are presented in a manner that takes account of the objectives, interests, and communication needs of decision makers. One challenge is to effectively communicate high-consequence risks that have a low probability of occurring. Ongoing, trustful relationships between researchers and decision makers will facilitate the creation of useful climate-related information.

### Future Scenarios Tool

 [Learn about this too](#)



MSU's *Pileus Project* provides tools for decision makers, such as websites that allow them to explore potential climate change scenarios. (Winkler 2007)

## Prescriptions for Action

- ◆ **Spread the word.** Although public awareness of climate change has grown in recent years, many people are still unaware of how climate change might affect the Great Lakes Region, actions they can take to mitigate effects, and the need to adapt.
- ◆ **Assessment matters.** In order to determine vulnerabilities and set priorities for adaptation, place-based assessments of climate vulnerability should be conducted at multiple scales. Participatory stakeholder-researcher partnerships can contribute to successful assessments.
- ◆ **Think and act locally and regionally.** While instituting responses to climate change may be more effective or feasible at a local level, these efforts must be coordinated in order to avoid redundancies or contradictory actions.
- ◆ **Climate change must be integrated into existing decision processes.** Climate change can not be addressed independently. Rather, the potential effects of climate change must be considered as part of other planning processes, such as long-term budgeting and land-use planning. For example, infrastructure must be built to accommodate a wide range of climate conditions.
- ◆ **Adaptation is not a one-time decision.** Due to uncertainty, climate-related decisions should use adaptive management models, so we do not become locked-in to maladaptations. This requires continued monitoring of changes, evaluation of adaptive responses, and revisiting critical decisions on a regular basis.

More information about the symposiums and other ESPP climate-related activities is available at <http://environment.msu.edu/climatechange>, or from: the Environmental Science and Policy Program, Michigan State University, 274 Giltner Hall, East Lansing, MI 48824; 517-432-8296.

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