

Great Lakes Climate Needs: A Guide for Implementation

The Great Lakes Sea Grant Climate Network Logic Models were developed in 2011 to help guide the work of Sea Grant climate specialists, both within their states and within the region. The logic models help to coordinate climate work between different Sea Grant agencies by listing current regional projects, and set consistent priorities for efforts across the Great Lakes states.

A 2012 needs assessment (NOAA Technical Memorandum GLERL-158) further refined Great Lakes climate change information needs, and focused specifically on the top 10 needs of professional planners, stormwater managers, natural resource managers, public health officials, and emergency managers. Given the projected impacts of climate change in the region

– increased extreme precipitation, associated increases in flooding, but also drought and increased heat waves – these officials are one important stakeholder group in the climate adaptation process.

While many areas of need are already addressed by projects included in the logic models, four areas could especially benefit from additional work: financial resources and guidance, climate change data, understanding climate impacts, and ecosystem research and monitoring. If you are interested in learning more about ongoing or future projects, or if you would like to suggest a collaboration, please contact the Sea Grant program listed after the project of interest, or your home state's Sea Grant program.

Need: Climate Literacy

Increase climate change literacy through research that addresses decision-maker needs, comprehensive science education throughout all grade levels, and informal science education for the public.

Logic Model Components

Current Projects

Current climate literacy projects within the Great Lakes Sea Grant Network cover a range of topics and delivery methods, from in-person workshops to online resources.

- NEMO (Nonpoint source pollution Education for Municipal Officials) program – Minnesota Sea Grant and others
- *Global Change, Local Impact* climate webinar series – Ohio Sea Grant, Ohio State University Climate Change Outreach Team (2009-2013)
- Climate Tools Café webinars – Ohio Sea Grant (2012, 2013)
- Great Lakes Climate website – Ohio Sea Grant
- Core competencies for climate change outreach professionals – Great Lakes Regional Water Program
- National Estuarine Research Reserve (NERR)/Sea Grant activities
- Completion of Climate Ready Great Lakes Workbook
- Workshop to teach Sea Grant staff to integrate climate messages into their programming offered at the GLSGN Meeting – Michigan Sea Grant, Illinois-Indiana Sea Grant, Minnesota Sea Grant (October 2012)
- Aquatic Invasive Species Curriculum – Pennsylvania Sea Grant, New York Sea Grant
- Updated and expanded *Great Lakes Climate Change Curriculum* – Ohio Sea Grant
- 1-Day curriculum training workshops for teachers – Ohio Sea Grant (2012)
- Curriculum training webinar for regional teachers – Ohio Sea Grant (2012)
- Stone Lab Climate Change Education course – Ohio Sea Grant (2012)
- Stone Lab Climate & Sustainability Course – Ohio Sea Grant (2012)
- Teacher training in Aquatic Invasive Species – New York Sea Grant
- Stone Lab climate workshop activity for grades 4 to adult – Ohio Sea Grant
- Toolkits for place-based educators – Ohio Sea Grant (2013)
- Supplemental Newspapers In Education Lessons – Pennsylvania Sea Grant
- Carbon Sequestration Display – Ohio Sea Grant, Cleveland Metroparks
- Family Weekend Discovery Lab – Ohio Sea Grant, Old Woman Creek NERR (2012)
- Traveling climate education display – Ohio Sea Grant, Old Woman Creek NERR

Future Outputs

Future planned climate literacy projects will focus on continuing already established programs, and widening the reach of those programs throughout the Great Lakes region. In addition, audience targets will be expanded to reach a wider range of Great Lakes citizens with education materials.

- Survey on current climate knowledge
- Goals, Objectives and Recommendations for the Improvement of Climate Literacy in the Great Lakes Region
- Training for communicators to develop and coordinate consistent messages across the region
- Workshops on current climate research for Sea Grant staff
- Media trainings for Sea Grant staff and trusted sources
- Creation of additional Great Lakes climate curriculum materials
- Curriculum materials will be tested with selected classes to solicit feedback from educators
- Additional teacher training workshops (professional development days, education conferences) to help integrate climate curriculum materials into lesson plans
- Consolidation of NEMO materials and other climate adaptation materials (manuals, fact sheets, brochures)
- Creation of shared climate change materials, such as presentations, workshop guidelines, education tools, press release templates, news articles, and fact sheets
- Creation of educator tool kits for teaching climate change – Ohio Sea Grant
- Regional climate portal website to house materials for educators, community planners, and the general public – Ohio Sea Grant
- Submission of Great Lakes Climate Change Curriculum to EPA Climate Kids website, NCSE website – Ohio Sea Grant
- Whitepapers: Great Lakes Climate Science, Great Lakes Climate Education
- Creation of online game to teach simplistic modeling and understanding of climate models

Additional Recommendations

Continued development and updates to current curriculum materials ensure that the next generation of Great Lakes residents has an opportunity to learn about the variety of resources the Great Lakes ecosystem provides. Adaptation of those curriculum materials to other audiences (adult education, place-based education facilities, extension education, professional development, etc.) makes use of already existing information and broadens audiences without requiring a large amount of additional funding. See *Great Lakes Network Climate Education and Outreach Strategies: An Integrated Approach*, available from Ohio Sea Grant, for more details.

Need: Regional Needs Coordination

Build relationships between organizations at the federal, state, and local levels for the sake of efficient knowledge exchange.

Logic Model Components

Current Projects

To organize Sea Grant and other programs providing climate information and training, needs assessments and surveys clarify stakeholder needs, while social networks allow for coordination of efforts between programs.

- Needs Assessment, Strategy & Implementation – Old Woman Creek NERR
- Great Lakes Climate Change Science and Education Systemic Network (funded by NSF)
- National Sea Grant Climate Network Ning site provides a forum for Sea Grant Extension Staff engaged in climate programming to communicate, share best practices, and learn from one another
- Climate knowledge survey of Cooperative Extension and Sea Grant agents – Great Lakes Regional Water program
- CCCAI Legislative/Decisionmaker survey – Ohio Sea Grant (2010)
- Articles on climate research topics and researchers – Ohio Sea Grant
- Climate Change Education Partnership Workshop (2012)
- RISA connections to be more proactive in networking with researchers – Ohio Sea Grant

Future Outputs

Widely accessible online resources will allow stakeholders to directly interact with programs, as well as obtain information more easily. Continued development of networks and documentation of those networks will also continue to encourage collaboration and reduce duplication of efforts.

- Regional climate portal website to house materials for educators, community planners, and the general public – Ohio Sea Grant
- Develop a tool to identify early adopters of climate change planning
- Online resources for sharing between Sea Grant programs
- Assistance in community planning information needs, relationship building (e.g., providing GIS support for community vulnerability assessments)
- Virtual Great Lakes Climate Change Community Platform
- Great Lakes Climate Science-Education Network Map (including analysis of strengths and weaknesses of communication pathways)
- Great Lakes Planning Document for the Systemic Integration of Climate Change Science and Education
- A Great Lakes section of the National Sea Grant Climate Network will be populated with previously created content (Ning system includes capabilities to support discussion and commentary)
- WebEx meeting of SARP I climate staff and new staff to connect and share information
- GLSGN Regional Portal for Climate Information
- Working groups in each state will update stormwater design manuals

Additional Recommendations

Sea Grant Extension agents already have networks of community leaders in place, being trusted providers of information on a variety of topics. While climate change remains a controversial topic in many communities, including this information in other outreach programs can be an effective way to introduce it to decisionmakers without having them focus exclusively on this one area of concern. Ideas for this integrative approach can be discussed within existing agent networks so programs can learn from each other as much as possible.

Need: Financial Resources and Guidance

Resource leverage for climate adaptation.

Logic Model Components

Current Projects

There are no current financial resources and guidance projects included in the logic models.

Future Outputs

In addition to knowledge support (climate literacy, modeling, planning assistance), one of the largest hurdles for communities working on climate adaptation is financial. Local budgets are stretched everywhere, and political climates may not be supportive of financing climate adaptation. Grants and other financial support for climate adaptation will have to be an integral part of future climate programming.

- Grant resources to help implement Best Management Practices across the Great Lakes region

Additional Recommendations

In addition to providing grant competitions, programs should consider collecting grant opportunities from other sources in an easy-to-use database or online newsletter. Non-governmental organizations and non-profits often provide small funds for community action projects, but those opportunities can be hard to find when people don't know what to look for. Connecting citizens to these opportunities could be a worthwhile effort in financing climate adaptation, especially on a local scale.

Need: Information Tools

Management, coordination, and adjustment of maps, models, and collected data to incorporate new information and to allow for regional forecasting, analysis, and assessment of climate change related events.

Logic Model Components

Current Projects

Sea Grant representatives are currently involved in projects that provide climate information to Clean Marina programs, watershed plans, and water resource conservation.

- Add section on climate adaptation to Clean Marina certification
- Presque Isle Watershed plan list completed, now started work on Lake Erie watershed plan – Pennsylvania Sea Grant
- Involvement in regional water supply plan (CMAP) and water conservation toolbox (NIRPC) – Illinois-Indiana Sea Grant
- Integrated water resource science/services (IWRSS) – GLRI proposal with NOAA, USACE, USGS

Future Outputs

In addition to continuously developing and updating tools, marketing existing resources to their intended audiences is an essential part of providing climate adaptation tools to stakeholders in the Great Lakes region.

- Tools Assessments: inventory of existing tools, development of new tools, access to GIS and other mapping tools, vulnerability assessments, benchmarking tools, mitigation resources
- Complete Climate Ready Great Lakes modules
- Public online resources
- Training: seminars/engagement of researchers in training SG staff on how models work
- SARP I: Visualization Tools Inventory
- Overview fact sheet on NOAA Climate Tools – Ohio Sea Grant

Additional Recommendations

Some Sea Grant programs have developed tools for the public to use in their home or daily life, such as Connecticut Sea Grant's rain garden app. Additional tools along the same lines, mostly non-technical and designed for those without an extensive background in science or community planning, would raise awareness of the need for climate adaptation while providing opportunities for interested citizens to put thought into actions. In turn, this increased awareness could increase demand for community, local, or statewide actions and require those decisionmakers to consider climate adaptation as part of the planning process.

Need: Resilient Land Use Planning

Research and implementation of resilient land use and physical planning/design that incorporates local economic drivers, infrastructure management/monitoring, transportation, and land-sea interactions.

Logic Model Components

Current Projects

Resilient land use planning projects in the Great Lakes region tend to focus on water – stormwater runoff is a major source of pollution for the lakes, and community infrastructures, if not planned well, can negatively impact the environment and become affected by a changing Great Lakes climate in the future, leading to increased cost and inconvenience for residents.

- Full cost pricing for water & wastewater presentations and workshops – Illinois-Indiana Sea Grant
- Involvement in NIRPC's climate change committee for 2040 regional comp. plan – Illinois-Indiana Sea Grant
- Involvement in Chicago Wilderness climate change adaptation plan for nature – Illinois-Indiana Sea Grant
- Milwaukee (MMSD) is buying land to create wetlands in upper watershed
- Working with property owners to put in more green space in parking lots along sidewalk – Erie, PA
- Ongoing land conservation projects anywhere along coast (some projects focus on stream protection) – Erie, PA
- GLRI project will fund runoff scenarios under climate change conditions for 3 Great Lakes watersheds
- Funding Potter et al (2010-12) to address CD and stormwater management needs – Wisconsin Sea Grant
- Potter starting to work directly with engineers, communities on re-sizing infrastructure – Wisconsin Sea Grant

- Coastal community grant for Wisconsin: work with 1 selected community to assess/develop climate change (stormwater) preparedness plan
- Assist with policy development, NERRS science collaborative/OH CTP, proposal pending to do BMP modeling, monitoring, incentive and ordinance development – Ohio Sea Grant

Future Outputs

Planned future outputs continue current focus areas, and add an element of networking.

- Model ordinances and regulatory language (e.g., on coastal setbacks, groundwater areas overlay zones, wetlands protection ordinances)
- Facilitation at the watershed level (bringing multiple audiences together)
- Assist state and communities in developing policies, model ordinances; delivery through SCD network
- Integration of community level MS4 and stormwater regulatory requirements on a watershed basis
- Community stormwater vulnerability, failure analysis, and strategies for resiliency

Additional Recommendations

Continued networking, both between programs and with community decisionmakers and citizens, will improve communication about climate adaptation and increase acceptance of adaptation measures. Vulnerability assessments on the community level, in as many communities as is feasible, will also allow stakeholders to learn about potential adaptation needs right in their backyard, making issues more relevant and therefore more likely to be addressed.

Need: Climate Change Data

States, municipalities, and managers need current, comprehensible, near-term, and regionally relevant climate change data to incorporate into decision-making (e.g. drafting ordinances, master plans, and evacuation plans).

Logic Model Components

Current Projects

Programs across the region are working to develop data visualization tools, as well as making data sets more locally relevant through downscaling models.

- Hydrologic Dashboard – Wisconsin Sea Grant
- IJC upper lakes modeling work – US/Canada/GLERL
- WICCI is developing down-scaled climate projections including seasonality, depth of frost, humidity, ET, etc. – Wisconsin Sea Grant

Future Outputs

The logic models include no further climate change data projects.

Additional Recommendations

Downscaled, regionally relevant data is one of the most requested pieces of information when talking about climate adaptation to community decisionmakers. Continued work on making climate models as locally relevant as possible will help to encourage climate adaptation in many Great Lakes communities.

Need: Social and Ecological Research and Community Resiliency

Engineering, design, and social research as it applies to data collection methods, modeling, forecast uncertainty, extreme event attribution, and community resiliency.

Logic Model Components

Current Projects

Current community resiliency to climate change is addressed by one current project included in the logic models.

- OR SARP project “Grand Marais, MN Community Readiness Report” – Minnesota Sea Grant

Future Outputs

Vulnerability and readiness assessments will continue to help communities plan for climate change effects, especially in the face of extreme weather events.

- Assess community needs for climate change adaptation, both to identify community requirements for updating plans and to identify community's vulnerability
- Prepare case studies of communities already preparing for climate change
- BMP effectiveness comparisons including cost/benefits
- Develop a pre/post survey or checklist as needed of climate adaptation practices/BMPs

Additional Recommendations

Continued modeling efforts, as well as communication about these efforts through case studies, will provide community decisionmakers with materials to support the need for climate adaptation measures. Including economic factors in these case studies, such as cost-benefit analysis, will broaden the appeal of studies by showing that climate adaptation can also have financial benefits.

Need: Decision-maker Trainings

Trainings utilizing sector-specific and general strategies to implement clear and flexible ecosystem-based management programs.

Logic Model Components

Current Projects

Training programs for teachers and community planners are available in a number of Great Lakes states.

- Lake Erie NEMO program – Pennsylvania Sea Grant
- Planning with POWER: GL Climate Change Network train the trainer Climate Ready Great Lakes October 2012 – Illinois-Indiana Sea Grant
- CMAP water conservation municipal outreach – Illinois-Indiana Sea Grant
- Presentation on community planning for climate change in the Great Lakes region for public officials and Sea Grant educators (CCCAI project) – Michigan Sea Grant
- Conference on climate change adaptation for communities (CCCAI project) – Michigan Sea Grant
- Presentation on climate change and water quality/stormwater – Minnesota Sea Grant
- Guidebook to Stormwater BMPs under altered GL climate (also addresses climate change implications for stormwater management) for public officials (CCCAI project) – Michigan Sea Grant
- Update NOAA's Climate Ready Great Lakes presentations and training materials
- Develop online coastal climate training modules – Wisconsin Sea Grant and UCAR COMET
- Coastalclimatewiki.org already posting videos of training
- Toledo Climate Adaptation Workshop Fall 2012 – Ohio Sea Grant
- Erie Climate Ready Adaptation (Module 2) – Pennsylvania Sea Grant

Future Outputs

Continued development of education materials for educators and community planners is the focus of a number of planned projects as well.

- Workshops/ training/webinars
- Pilot sites for doing GLC4 modules
- Develop a regional powerpoint presentation and materials for use by all SG programs to be used in local communications on stormwater and need for infrastructure analysis
- Training for engineers/system designers/stormwater managers on performance of stormwater practices

Additional Recommendations

Repurposing information from one form of educational material to trainings for community planners and other decisionmakers can cut the cost of developing new programs by using already-available information. See *Great Lakes Network Climate Education and Outreach Strategies: An Integrated Approach*, available from Ohio Sea Grant, for more details.

Need: Understanding Climate Impacts

Assessing the impacts of climate change on natural resource demands and budgets, including differential impacts across sectors.

Logic Model Components

Current Projects

Presentations, in person and online, are the focus of projects related to educating Great Lakes citizens on climate impacts in the region.

- Climate Change and Aquatic Invasive Species Presentation – Pennsylvania Sea Grant
- *Global Change, Local Impact* webinar series – Ohio Sea Grant

Future Outputs

More specific education materials related to stormwater management will be developed by Michigan Sea Grant.

- “Guide to stormwater BMPs under altered Great Lakes Climate” – Michigan Sea Grant

Additional Recommendations

While understanding the impacts of a changing climate on the Great Lakes is a part of many of the projects that address other needs, few focus specifically on educating Great Lakes residents about climate change in the region. This may or may not be a good thing – most Extension agents will prefer including small pieces of climate change information in presentations on larger topics, instead of materials specifically focused on climate change. Determining and maintaining a balance between explicit climate education and a less explicit approach will continue to be a challenge for Great Lakes Sea Grant programs, and agent networks should address this challenge in conversations on a regular basis.

Need: Ecosystem Research and Monitoring

Biological and ecological research, assessment, and monitoring, as well as prioritization of ecosystem preservation, in order to mitigate environmental stressors and monitor ecosystem health.

Logic Model Components

Current Projects

Training and restoration projects in Illinois-Indiana and Pennsylvania address ecosystem research and monitoring.

- GLRI funded “Healthy Landscapes Healthy Lakes” will provide training in lawn/landscape BMPs that reduce stormwater runoff/toxics content of stormwater runoff – Illinois-Indiana Sea Grant
- Cascade Creek installation of riparian buffers/stream restoration project (GLRI proposal) – Pennsylvania Sea Grant

Future Outputs

Few projects are planned in this category, with educational workshops the main focus for Sea Grant programs.

- Researcher seminars for public/managers

Additional Recommendations

Based on the needs assessment responses, expanding from training workshops into funding restoration projects would be received positively by community planners and watershed managers. Citizen science programs could also contribute needed ecosystem data without relying on Extension staff or researchers for data collection.