Huron River Watershed Council
Creating Climate Resilient Communities

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Project Purpose

More and more, community leaders and water and natural resource managers are acknowledging the need to consider climate change when making decisions and determining courses of action. However, available information about climate change and its impacts is often not relevant or difficult to understand. This is an often cited barrier to action at the local scale. Simultaneously, when looking at the recent climatic record, southeast Michigan is experiencing more extreme weather events. During the past 30 years, records show more frequent and prolonged summer droughts, more frequent large rain events during spring and fall, and shorter winters. These are tangible changes that this region is realizing already. Models predict these trends to continue.

The Creating Climate Resilient Communities project aims to demystify climate change for decision makers in the Huron River watershed by providing relevant and appropriately packaged information, facilitating discussion as to how this information impacts various water resource-focused sectors and supporting the implementation of priority actions for each of those sectors. Empowered with useful climate information and an understanding of the impacts of these changes to their sector, participants involved in the project can be thought leaders in their field helping lead the way forward toward climate resiliency.

Approach

Since 2011, the Huron River Watershed Council, with support from GLISA, has been leading a process to address local climate change impacts by convening interested stakeholders to determine information needs and strategies that build resiliency to climate change in the watershed. The project is being conducted at the scale of a watershed and is organized around water resource sectors likely to be impacted by climate change.

The Huron River watershed encompasses approximately 900 square miles of southeast Michigan and contains parts or all of 67 municipalities. Working at the watershed scale provides the opportunity to work across municipal and other jurisdictional boundaries to implement adaptation actions necessary to build the resilience of local water resources. Further, by organizing efforts within a sector, climate information and strategies can be derived with a level of specificity that can promote tangible change to the policies, plans and practices specific to a sector.

In December 2011, a kick-off plenary session was held and water resource professionals, municipal staff and elected officials from throughout the watershed were invited to attend. This half day affair provided attendees with an overview of global, regional and local climate change and facilitated discussions within sectors about the potential impacts of these changes. Attendees were introduced to and invited to participate in the Climate Resilient Communities project.

The project began with three sector teams:

- The **Water Infrastructure Team** includes water managers responsible for water utilities, wastewater treatment facilities and stormwater management
- The **Instream Flows Team** includes dam operators, fisheries biologists, and hydrologists
- The **Natural Infrastructure Team** includes land managers involved with land preservation, restoration and management and urban forestry

In 2014, a fourth sector team was launched, building on lessons learned from the initial groups:

- The **Hazard Mitigation Team** includes hazard mitigation and emergency response professionals

To initiate the project, each team went through a six month intensive where participants met once a month for 2 hours. Teams range in size from 8-12 practitioners, 1 facilitator provided by HRWC and 1 climate scientist provided by GLISA. The three goals of this intensive period are to:

1. Expose participants to the best local climate change information available
2. Facilitate a discussion between climate scientists and practitioners to identify what additional climate information would be helpful to support decision-making within the sector and how to best package that information, and
3. Determine initial climate adaptation strategies the teams felt were necessary to build resiliency to climate change into the practices of the sector.

In subsequent years, teams meet quarterly to discuss emerging issues and make progress on strategy implementation. Between meetings HRWC, GLISA and team members work together where necessary to advance adaptation strategies.

This methodology was developed to achieve multiple outcomes. Project participants would increase their climate literacy and feel empowered to use this knowledge to influence the policies and practices within their sector. Climate knowledge would be created and packaged to enable climate-informed decision-making. Finally, this cadre of knowledgeable advocates, armed with appropriate information are able to affect change within their sector leading to increased resilience to climate change.

Sector Team Activities, Outputs and Outcomes

Each of the initial sector teams completed reports[1] that chronicled how climate is changing in the Huron River watershed, how these changes are likely to impact the sector, and a description of several strategies that, if implemented will build resilience in the sector to these impacts. Results were presented in a plenary session in March 2013. The newly formed Hazard Mitigation Team will be developing a similar report in 2015.

Improving stormwater management in the Huron River watershed

Improving information access and communication among dam operations of the Huron River mainstem

Review of climate impacts to tree species of the Huron River watershed

In addition, each of the sector teams are actively pursuing one or more climate adaptation strategies with the support of the Huron River Watershed Council and GLISA.

Water Infrastructure Team

Paradigms governing stormwater management in the watershed need to shift if the sector is to possess the agility necessary to employ innovative practices and adapt to changes in climate. Currently, stormwater is most often addressed at the pipe rather than where it falls. Additionally, planning and infrastructure decisions are made based on historical context and out-of-date data, rather than using the most current data and anticipated future conditions. As a result watershed communities are vulnerable to larger, more frequent storm events risking increased flooding as system capacity is taxed and aging infrastructure fails. These risks are exacerbated by increased development in the watershed with increased impervious surface, all designed to manage smaller storms than are expected currently and in the future.

Recommendations of the Water Infrastructure Team:

1) Improve accuracy of rainfall frequency curves adopted by the state and local governments, which are used as the basis of stormwater-related decisions; and
2) Implement a series of high priority "no-regrets" actions to improve the practice of stormwater management in the watershed.

The team provided data and review to the national revision of rainfall frequency curves conducted by NOAA in 2012-2013. This analysis defines the likelihood of storms of a particular size and duration. Stormwater management and infrastructure decisions are made based on these storm definitions. Ensuring the new analysis made use of the best available data ensures more appropriate management of stormwater by municipalities. The revision was published in April, 2013. The team also provided input to the State of Michigan as to how the results could be best used for regulatory and permitting purposes. In addition, the group is developing a resource kit for stormwater managers that provides the data, rationale, implications and best practices for the use of the revised rainfall data to help local municipalities know why and how to improve stormwater decision making within the context of climate change. Actions are taking place within two counties and at least one city in the watershed to adopt the new storm definitions and use them as the basis for stormwater management decisions.

Instream Flows Team

The Huron River has 17 dams in place on the main stem of the river which are owned and operated by nine different entities. Dams are operated to achieve multiple goals including recreation, maintenance of lake levels, and production of hydropower. Operators adjust dam structures to respond to changes in flow upstream. There are a few stream gages throughout the watershed to help provide data on flows to operators but those data only tell part of the story. There are many river reaches that can influence flow in an area dramatically, but lack gages. Also, changes to the operation of upstream dams will influence the timing and amount of flow a reservoir will receive downstream. The Instream Flows Team determined access to data and better communication among dam operations in the watershed would improve the efficacy of flow management and improve preparedness for extreme events such as floods and drought.

Recommendations of the Instream Flows Team:

1. Establish additional stream gages in the watershed in order to provide more comprehensive flow data and relevant and timely data to individual operations; and
2. Network dam operators and affiliates from each of the main stem operations to facilitate communication pertaining to changes in dam management and provide a forum for learning and information exchange.

[1] Reports of the Climate Resilient Communities Sector Team Working Groups are available for download from the Huron River Watershed Council (hrwc.org/climate-resilient-communities). Hard copies of the reports are also available. Contact Rebecca Esselman (resselman@hrwc.org).

The Instream Flows Team has established a communication network among dam operators on the mainstem of the Huron River. An established precedent for communication among operators improves preparedness for larger, more frequent storm events as well as drought conditions. Additionally, operators should be able to improve day-to-day operations as regular communications allow for proactive rather than reactive management to changes in flow, exchange of knowledge and solutions to common issues, and a shared understanding of challenges and constraints under which the various dams are operating. An initial gathering of the Huron River Dams Network occurred in November, 2012. HRWC is facilitating the network, which now meets twice annually. Network members are communicating about topics such as dam safety, system level capacity for managing flows and solutions to shared issues such as ice dams and algal blooms.

This team has also engaged both USGS and the University of Michigan to coordinate discussions on flow monitoring and stream gages. Difficulties maintaining funding for federally maintained long-term gages have resulted in discussions as to how to continue important flow monitoring at lower cost. A professor at the University of Michigan is currently piloting, low-cost real time flow monitoring for a few locations in the watershed.

Natural Infrastructure Team

There is a lot of complexity involved in trying to predict how species distributions will change and what the implications are for natural communities as they occur today. Several groups of experts have assessed the impacts of various climate scenarios on the plant species of North America including the US Forest Service and Natural Resources Canada. Predictions for species native to southeast Michigan can give natural resource managers insights as to how communities may be impacted by predicted range shifts in the characteristic tree species of these communities. Disseminating information on how natural areas may be impacted by climate change and communicating emerging solutions to build resilience in local natural and urban forests will provide the sector with information necessary to make climate-informed decisions.

Recommendations of the Natural Infrastructure Team:

1. Research how climate change is expected to impact key tree species in the watershed
2. Summarize findings in fact sheets and disseminate to key audiences

The Natural Infrastructure Team has completed the development of the Primer on Climate Impacts and Resiliency Strategies for Tree Species of the Huron River Watershed. The toolkit helps natural resource managers understand how climate is changing locally, the implications of these changes for local forest and tree resources and what management options are available to build resilience to climate change in forests and the urban canopy.

A full presentation training recipients on the contents of the toolkit was prepared which supports the implementation of the train-the-trainer program proposed by the Natural Infrastructure Team members as a way to get this information spread throughout the sector. Now, each of the project participants is able to speak with audiences within the sector about climate change locally and the implications of these changes for trees, forests, and the urban canopy. The team identified priority audiences to share this information with and members are actively disseminating the toolkit within the sector via in-person meetings and conferences.

Hazard Mitigation Team

Hazard mitigation and emergency management professionals are responsible for making decisions that minimize risk and decrease vulnerability to climate-related hazards such as ice storms, heat waves and flood events as well as how to respond when hazards occur. Hazard mitigation and emergency response planning based on up-to-date and forward looking climatic data will improve strategies and help appropriately scale response. Additionally, better coordination between emergency management and municipal planning will help establish communities more resilient to climate related disasters.

After a six month series of working sessions the Hazard Mitigation Team set the following recommendations:

1. Provide written materials and oral presentations on the topic of climate change and impacts expected in southeast Michigan to municipal staff involved in urban planning and emergency management.
2. Facilitate forums to increase communication and understanding between planning and hazard mitigation professionals and discuss locally feasible solutions that reduce hazard risks.

The team will meet quarterly in 2015 to advance these strategies.

Project Evaluation and Lessons Learned

At the end of 2014, a project evaluation survey was conducted to see how well the project had worked to achieve desired outcomes. As the project hit its three-year

mark, participant survey responses along with reflections by project facilitators elucidated several successes, challenges and lessons learned.

Lesson: Sector-based approach results in very actionable knowledge products and strategies however, team membership dictates action therefore every effort should be made to encourage broad representation on teams.

An underlying premise of this project was that members of a sector were best suited to understand the implications of climate change on the sector, identify strategies for adaptation within the sector and propagate both the knowledge and strategy implementation throughout the sector. This has proven true both to the benefit and detriment of the project. Several of the communities or organizations with participants in one of the sector teams are employing the use of the climate information produced as part of this project and are taking actions consistent with the recommendations of the sector teams. The corollary though is that little action is taking place in communities or within organization without representation on the sector teams. Effort will continue to improve the reach and impact of the project through broader representation of watershed communities and partners on sector teams.

Additionally, new partners have been engaged that are in a position to provide expertise or take action to move an adaptation strategy forward. A University of Michigan College of Engineering lab is prototyping new data sensors that could provide more comprehensive real-time flow data for the Huron River system. The Michigan Department of Environmental Quality is working with teams to improve dam management in the watershed and operationalize the regional precipitation frequency data at the state level.

Lesson: There is a considerable lag time between advocating for change and actually seeing that change happen. Similar projects should be prepared to invest multiple years seeing strategies through to fruition.

It takes time to get through the process of localizing climate knowledge, understanding the implications of this new knowledge, determining an appropriate course of action that builds resilience, then promoting that action within a sector. It takes time beyond that to actually change a policy or practice at a meaningful scale. After three years, team members are advocating for change within their sector. In a few cases, proposed actions have been implemented either through incorporation into a plan, change in policy or alteration of a standard practice. For example, the Washtenaw County Water Resources Commissioners Office has revised their stormwater rules to require additional on-sight infiltration of stormwater. The rules took two years to update and recently went into effect. Two other counties are considering similar revisions.

Lesson: Through this process, both participants and HRWC facilitator have significantly increased capacity to communicate about local climate change, impacts and potential solutions.

Participants generally have a high level of confidence in communicating with colleagues, leadership and elected officials about how climate is expected to change locally, what the implications of those changes are and recommended courses of action to mitigate impacts of climate change to local communities. Additionally, since knowledge products were produced in tandem with climate scientists, helpful written materials exist to support assertions and recommendations made by participants.

Lesson: Ongoing consult and presence of a climate scientist is essential to project advancement though the amount of support necessary has reduced considerably over time.

During the early phases of the project, in particular, during the workgroup meetings occurring in the first 6 months, there was significant dialogue between practitioners, HRWC staff, and GLISA climate scientists to identify and create actionable climate information. In the following months, the relationship between practitioners and scientists changed. The focus of discussions shifted to potential climate impacts and what to do about them. Having a climate scientist available during these ongoing conversations allowed practitioners to probe for additional information or clarification and allowed the climate scientist to interject new information that could be useful for problem solving. In the absence of this ongoing exchange, the technical rigor and scientific basis for strategies would have been weakened.

Lesson: Direct and ongoing engagement with information consumers (CRC participants) provides insight to knowledge producers (GLISA scientists) that are applicable to new projects and contexts.

GLISA is testing several models to achieve their goals efficiently and effectively. For the CRC project, GLISA chose to provide multiple years of support to see if longer

engagement provided added benefit over shorter-term investments.

With this investment, GLISA has been able to narrow in on the types and formats for climate change information most useful for practitioners and decision-makers. The back and forth exchange between the producers and consumers of climate information led to products that were not only useful to participants in the CRC project but also to decision-makers in other contexts and locations.

Lesson: The initial amount of climate information presented to new groups need not be comprehensive or impact-oriented.

For the initial set of three working groups, GLISA staff presented climate information in a traditional format early inthe project. Information was delivered via a one-way presentation that provided a description of the physical climate changes observed and projected for the watershed as well as potential impacts to ecosystems, urban, environments, and water systems..

While this is a logical strategy to establish a shared baseline of knowledge among participants, receiving so much information at the onset may be overwhelming. Participants needed to revisit climate information throughout the course of following meetings. A subtle change to the strategy of information delivery may be more effective at achieving the same goal.

An alternative method was used when initiating the forth workgroup, the Hazard Mitigation team. This team received a presentation covering only the locally-relevant physical climate changes. simplifying the amount of knowledge workgroup participants needed to retain. This was then followed by a group discussion of impacts. Climate change often amplifies existing environmental vulnerabilities or benefits to an area. Having participants identify these unique, local vulnerabilities and contribute to the description of how physical changes may lead to potential impacts can more rapidly build the linkage of broad, regional-scale climate change with location-specific impacts. The need to revisit baseline climate information is reduced when participants are allowed to make the connection between observed and predicted changes to the climate and local impacts of these changes through ongoing work group discussions.

The Hazard Mitigation workgroup participants efficiently and naturally applied the information presented to vulnerabilities they could identify. Despite having fewer meetings, this team progressed more rapidly to identifying key climate adaptation goals.

Lesson: The exercise of considering current issues from a climate perspective elucidates best practices even if future climate change is not part of the conversation.

There is often pressure in academia to find quantifiable correlations between the data presented to stakeholders and their actions taken. Null results that show the data did not result in a direct, data-driven action may be challenging to describe, are inaccurately characterized as failure, and are difficult to publish in traditional contexts. Therefore, lessons learned from attempts at data dissemination that do not lead directly to action, or that lead indirectly to different actions, often go unshared. From a practitioner's perspective, these null results can be just as informative to improving the process of information translation as positive results.

A common example of a valuable null result, when dealing with climate adaptation information, is the discovery of non-importance. Identifying adaptation efforts that cannot or need not be informed by climate data can help avoid misapplication of resources. Additionally, when climate change does not have a direct impact on a particular issue, or the impact is confounded by many other local variables, there is still value in viewing system-wide problems from a climate perspective.

Over the early course of this project, the in-stream flows workgroup was provided information on the historical trends in precipitation and potential changes in extreme precipitation events. After considering the limitations of available precipitation data and realizing that even ideal climate projections would not significantly alter strategies for managing flows in real-time, the group determined no climate projection information could realistically address the most pressing issues of managing flashy flows. An early goal of translating information to the workgroup yielded a null result.

Knowing, however, that such flashy flows were likely to become more frequent and more severe, the workgroup began to view the issues from a systemic, watershed perspective, and concluded that a more robust communication network between dam operators would lessen current vulnerabilities likely to be amplified by climate change. Without acknowledgement of the preceding null result, that precipitation projections did not provide data relevant to alter planning of flow management, the actions the workgroup did eventually take would not have been possible.

Conclusions

The Climate Resilient Communities project has successfully galvanized a group of informed professionals in several water resource related sectors. At the close of the third year of the project, adaptation strategies are in various stages of implementation and team members are still invested in changing practices within their sector to increase resilience to climate change. Participants now have a strong understanding of how climate is predicted to change in the watershed and have spent meaningful time thinking through what this means for their professions. Teams determined where their sectors were most vulnerable based on predicted changes to local climate and built strategies to reduce these vulnerabilities.

This process does not result in comprehensive climate adaptation plans. Completing such a plan would be a logical next step with municipalities interested in building resilience into all aspects of community life. This process has proven effective as a way to get targeted, high impact implementation of adaptation actions underway without extensive planning processes and to build a network of informed practitioners with the will and capacity to continue to affect changes necessary to adapt to a changing climate.