Forwarding Adaptation in the Great Lakes Region

A Resource Guide for Local Leaders
SUSTAINABLE COMMUNITIES LEADERSHIP ACADEMY

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ABOUT THE INSTITUTE FOR SUSTAINABLE COMMUNITIES

Since its founding in 1991 by former Vermont Governor Madeleine Kunin, ISC has led 80 transformative, community-driven projects in 24 countries. ISC specializes in developing and delivering highly successful training and technical assistance programs that improve the effectiveness of communities, their leaders, and the institutions that support them. In April of 2012, ISC launched the Sustainable Communities Leadership Academy website to make the valuable, high caliber information from our first-class peer-learning and training workshops available to practitioners in any

ABOUT THE GREAT LAKES ADAPTATION ASSESSMENT FOR CITIES

GLAA-C is one of several engaged problem-solving initiatives of the Graham Sustainability Institute at the University of Michigan. Through the support of the Kresge Foundation, and in collaboration with Great Lakes Integrated Sciences + Assessments (GLISA), the goal of GLAA-C is to bring together researchers and practitioners to develop actionable climate adaptation programs for cities in the Great Lakes Region. Over the next three years GLAA-C will work with five cities in the Great Lakes Region to develop and implement climate adaptation strategies in these cities. The GLAA-C program will also provide funding for a number of adaptation focused programs throughout the region. Cities participating in the SCLA will be candidates for participation in both of these programs. The work of GLAA-C is supported by six University of Michigan faculty members whose backgrounds include public health, public policy, governance, urban planning, and climate science. By incorporating research from all of these fields into climate adaptation solutions for cities, GLAA-C aims to create replicable programs to tackle the interconnected challenges which climate change presents.
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Increasing the Resilience of Great Lakes Cities | The Vision

An economically thriving, socially vibrant, environmentally rich region that produces state of the art goods and services. A region that exudes a distinct ‘sense of place’ where residents and visitors flock. A region where communities collaborate as opposed to compete. An international center of innovation, social ingenuity, and justice. A region that is resilient to economic, social and environmental hardships. A region that is prepared for climate change, taking actions to reduce its environmental footprint and preparing its citizens and ecosystems for changes in climate. This is the vision of the Great Lakes. The vision we aspire towards, and the vision that is within our reach.

Increasing the Resilience of Great Lakes Cities | The Need

Globally and locally, cities and towns are increasingly recognizing the need to become “resilient” to a more uncertain future. From extreme weather events to financial crises, local governments realize that the future isn’t the way we thought it would be. In many respects, it is our perception of likely futures that is changing; in other respects, our actions are in fact changing the nature of the futures we could possibly inhabit. Global climate change is a particular case of the latter category. The effects of climate change have already been felt in many places including in our own communities. Increased severe weather systems, drought, unprecedented shifts in the freeze and thaw cycle are all changes that have been experienced across the Great Lakes region in recent years. Projected future impacts of climate change in the Great Lakes region include (but are not limited to) decreased lake ice, warmer water and air temperatures, variable water levels within the region’s lakes, extreme precipitation/storms (snow and rain), northerly migration of some wildlife species, and longer growing season. For a full summary of anticipated climate impacts in the Great Lakes Region see the GLISA Climate Change in the Great Lakes Region fact sheet on page 17.

The reality of climate change is already affecting lives and economic vitality in the Great Lakes. According to a 2012 survey conducted by the University of Michigan found that 78% of residents in the Great Lakes Region believe that climate change is taking place and over 60% of them feel that climate change has already impacted their communities. Another 22% of respondents said they believe their community will be impacted by climate change within the next 24 years. Given the changes we are already seeing and individuals’ strong belief that their local community is, or will be, impacted by climate change, local governments are uniquely suited to lead their communities’ adaptation initiatives and build more resilient communities.

Successful climate change adaptation and resilience strategies in the Great Lakes will hold influence beyond the immediate region. The Great Lakes watershed houses nearly 10 percent of the U.S. and 25 percent of the Canadian populations (40 million people in total). The five Great Lakes and surrounding watershed account for one-fifth of the world’s fresh water systems and these systems play a pivotal role in every aspect of life, from public health to global business. The Great Lakes has an unprecedented opportunity to be a leader as the world realizes a new climatic reality.
Climate Change Adaptation | The Opportunity

Climate change adaptation is defined as efforts to prepare for or cope with the impacts of climate change. Adaptation planning is the opportunity for local and regional governments to evaluate their community’s resources and needs, in order to develop strategies which will enhance resilience to a more varied future. Adaptation differs from climate change mitigation (defined as actions to reduce the emissions that cause climate change) by focusing on local responses to already existing or anticipated changes in local or global climate. Often, many of these actions are designed to reduce the specific risk to people or property from a particular hazard (such as flooding) that specialists within the emergency management field term “hazard mitigation.” Specific examples of adaptation strategies include amending zoning ordinances to move development away from floodplains; increasing permeable cover; changing storm water management practices to accommodate increased volumes; instituting public health surveillance and early warning systems; situating roads/rails on higher ground; identifying alternative recreation activities consistent with seasonal shifts, among many others.

While some adaptation actions, such as increasing the urban tree canopy to reduce storm water runoff may have dual climate change mitigation and adaptation benefits, other potential adaptation strategies may uniquely address a local impact without affecting the drivers of global climate change. In practice, climate mitigation and adaptation strategies can work in harmony or in opposition; the art of the policy development process lay within the management of the tradeoffs. Preparing for climate change through adaptation can allow a city to galvanize action that will benefit the community regardless of the climate impact. Identifying and developing these win-win scenarios also provides a gateway for community leaders to discuss climate change at the local level.

Results from Interviews

To better understand common challenges and the state of climate adaptation and resilience practices across the Great Lakes, the Institute for Sustainable Communities (ISC) and the University of Michigan’s Graham Environmental Sustainability Institute consulted with nearly 60 local government practitioners from the 13 teams selected for the 2012 Forwarding Adaptation in the Great Lakes Region Leadership Academy. We found that, overall, challenges to adaptation and resilience were similar to other, national-level findings by ISC, but with some important differences specific to the region. The following summarizes our findings.

Communications and Public Engagement is the Foundation for Action: While public perceptions of the impacts of climate change in the region have increasingly aligned with scientific findings, most practitioners still struggled to prioritize the issue in their communities. An ongoing need to translate local impacts to understandable risks was found to be vital to make a tangible case for action. For some, this has involved strategic public outreach; for others, it has meant building new coalitions of private, public, and nonprofit representatives. Whatever the method of engagement, all communities agreed that without targeted public support, local action is difficult.

Collaborations are Difficult but Necessary: Local government practitioners faced added levels of complexity in working on climate change and adaptation and resilience because managing climate risks involves numerous agencies, some of which may operate outside of the government’s purview. Several communities, for example, found it necessary to engage a range of agencies and organizations responsible for the health of local watersheds. Groups responsible for natural and human-built water systems needed to be more aligned to address systemic issues caused by increased floods, drought, and human overuse and pollution. In all cases, collaborations were most successful when stakeholders were convened around mutual interests, and the benefits of collaboration were clear. For some, this meant reaching out to local insurance agencies to address potential climate-related risks, for others, it meant engaging with existing cross-sector sustainability coalitions.
Economic Evaluation of Adaptation Measures is Difficult: Since most adaptation measures involve investments in new technologies, policies, and practices, it has become increasingly important to estimate financial returns. The difficulty of this practice stems from the complexity of climate impacts, including their uncertainty and their tendency to intensify over time. Yet, despite these difficulties, many in the region have adopted innovative financing approaches, such as creating new revenue streams through the establishment of stormwater utilities, making innovative use of science and planning grants, or tying resilient infrastructure improvements to existing downtown development projects. Understanding and articulating the value of co-benefits that accrue to communities is important as well.

Methods Matter: As local and regional governments develop their own adaptation initiatives, there is an increasing demand for guidance and case studies documenting the “how-to” aspects of local climate adaptation planning. Watershed management, vulnerabilities to infrastructure, increased frequency and severity of storm events, droughts, and flooding, and urban forestry were just some of the issues being addressed. Fortunately there is a growing body of such guidance, as well as technical assistance services and regional networks. For example, the Canadian Clean Air Partnership has been providing an intensive municipal adaptation training program for Canadian cities that has helped set the standard for adaptation planning. And the Great Lakes Adaptation Assessment for Cities (GLAA-C) at the University of Michigan’s Graham Institute is ramping up its efforts at increasing cross-border collaboration on adaptation and resilience.

Integration or “Mainstreaming” of Adaptation is the Path for Action: Without coordinated, committed leadership, implementing adaptation and resilience strategies is at best a difficult pursuit. Practitioners understand that to be successful, adaptation and resilience must be integrated into the core of planning decisions, and form the basis for new internal and external partnerships. Many have taken the first steps by developing strong adaptation plans and frameworks that seek to integrate previously siloed sections of the government. Others have built from this framework to encourage champions and develop a new operational norm that matches new climate predictions. Learning is a Key Feature of a Resilient Organization: Local and regional governments are that are implementing adaptation strategies are struggling to develop ways to measure the extent to which they are increasing climate resilience. These places recognize that being better at learning, managing uncertainty, taking calculated risks, and assessing results are all attributes in which any organization that seeks to thrive in rapidly changing conditions must excel.

About the Guide

This Resource Guide represents a synthesis of information selected for the practitioners participating in the first regional workshop, Forwarding Adaptation in the Great Lakes, sponsored by the Graham Sustainability Institute at the University of Michigan, and the Institute for Sustainable Communities. The Resource guide is intended to help practitioners in local and regional governments across the Great Lakes region advance local adaptation and resilience strategies by showcasing promising practices, and by providing efficient access to some of the very best information and resources available.

The Resource Guide is not an exhaustive compilation of available information—a near-impossible task given the growing volume of international studies, reports, websites, books and blogs on the topic of climate resilience. Still, the document reflects an effort to identify, compile, vet, and synthesize useful information on innovative policies, programs, and practices being deployed in the region and throughout North America.
Building Relationships around Sustainability
Developing Trust and Credibility Across Departments and Sectors

Background

In May, 2007, John Coleman became Fayetteville, Arkansas’s first Sustainability Director. Yet, the City Council mandated that the position must pay for itself through annual energy savings. “People thought I was going to be kind of the light monitor going around turning computers off,” Coleman said.

The Fayetteville community has a strong history of environmental awareness, particularly around water quality issues, but sustainability was not well understood at the time of Coleman’s hiring, and formalizing sustainability within city government was an entirely new concept. Coleman—who was just 29 at the time, with little background in building energy performance, and no budget beyond his own salary—set about to prove that a sustainability office could be viable in Fayetteville.

Four years later, the City of Fayetteville has become one of the region’s leaders in sustainability. A few of the city’s accomplishments include:

- Adopting a Green Building Ordinance requiring all new public facilities to achieve LEED-Silver certification or greater;
- An annual sustainability report card on the progress of dozens of goals spread throughout all city departments;
- Implementing over $600,000 in energy efficiency retrofits including all of its primary public buildings;
- Revamped development codes that target infill development, discourage sprawl patterns, and support a wide range of housing within the city;
- A landmark Streamside Protection Ordinance and Low Impact Development Ordinance;
- A $500,000 grant award from the Home Depot Foundation’s Sustainable Cities Institute (one of just two pilot grants nationwide);
A grant from the International City Managers Association (ICMA) to develop a Solar Test Bed on its public library;

More than $700,000 in federal Energy Efficiency & Conservation Block Grant (EECBG) funds, including a municipal energy fund, LED pilot projects, a greenhouse gas emissions inventory, and a community revolving loan fund for local nonprofits;

A Sustainability Summit for mayors, business leaders, and experts in the region;

Restoration of dozens of acres of local parks, native prairie lands, forests, and streams.

In 2010, Coleman took charge of Fayetteville’s newly created Sustainability & Strategic Planning Office. Since then, the office has grown to three staff members (including Coleman), and despite a relatively modest discretionary budget of $25,000, a number of grants have provided the office with substantial resources to undertake new initiatives. For example, Coleman’s office is currently managing Fayetteville’s long-range master planning process for its Solid Waste & Recycling Division; upgrading the city’s residential and commercial building code; and partnering with local and national nonprofits to deliver community programming related to energy efficiency, neighborhood planning, and affordable, sustainable housing.

Coleman reports directly to the Mayor’s Chief of Staff, and works with all mayoral departments on projects that cut across the organizational chart. He also leads an inter-departmental “green team” with representatives from throughout city government. “I don’t think people would question the purpose [of a sustainability office] anymore, which is really helpful, and was an initial hurdle to overcome,” said Coleman. “Now [other departments] are asking how they can partner with us to bring in new resources.”

“I don’t think people question the purpose of (a sustainability office) anymore...Now (other departments) are asking how they can partner with us to bring in new resources.”
— John Coleman

**Process**

Coleman acknowledges that mayoral support, a receptive government staff, and an increasingly supportive City Council have helped to quickly grow the influence of Fayetteville’s sustainability office. But Coleman and his colleagues have also been strategic about cultivating support. Coleman utilized a number of innovative strategies to build trust and credibility, develop key relationships across departments, and become more involved in decision-making.

*Identifying Shared Goals, Delivering Value.* With a mandate to reduce Fayetteville’s energy bills, Coleman worked closely with the building services staff who managed all municipal buildings and had more authority and experience with building energy performance. His initial approaches were largely unsuccessful. “I would go in to a meeting with our building services guys and be thinking how to convince them to do what it is I want, instead of really trying to assess what their needs were and how they blended with what I needed to do,” he said.

Recognizing the need to form a cooperative relationship with the buildings team, he temporarily tabled his own agenda and began asking questions about the departments’ priorities and challenges. “Coming in and telling them how to make the building better, could easily have been an affront to them immediately.” Instead, he deferred to his colleagues’ expertise, learned about their needs, and began looking for sustainable ways to meet those needs.
Deferred maintenance on equipment in municipal facilities quickly surfaced as one of the department’s greatest challenges—staff spent a disproportionate amount of time dealing with equipment upkeep rather than running the buildings. Coleman identified the maintenance issue as a way to introduce energy efficiency into building management. “Once I figured that out, I would talk to them about the challenges of deferred maintenance, and then secondarily talk about the energy efficiency component,” he said. Together, they worked on a few small projects that would reduce the time staff spent on maintenance while simultaneously increasing energy efficiency.

These projects helped Coleman gain the confidence of the buildings staff, and produced cost savings, which the Mayor and City Council appreciated. Coleman also used the projects as the foundation for a much larger building performance contract—including the replacement of 30 HVAC units to improve the energy efficiency of seven of the city’s largest municipal facilities. Federal funding through EECBG program is allowing the city to retrofit the rest of its buildings.

“That really helped our building safety guys, to be able to show that while this more efficient equipment requires more money upfront—which can be a hit on their budget—in the long run, it saves them a lot of hours on maintaining old … equipment,” Coleman said. “Now the building services manager and I have a relationship where, even if we don’t always see eye-to-eye on every issue, he’ll run his decisions past me and is thinking about how I feel about them from a sustainability standpoint. He’s not required to do that, but we have a dialogue there, which is really helpful.”

Riding Recycling Trucks, Making Connections. In his first few years as Sustainability Director Coleman came to realize that he didn’t have a good sense of the work that many city employees were doing every day—especially those on the “front lines,” performing utility services. Likewise, he believed they lacked an understanding of his own job, his goals, and how he approached sustainability. This mutual lack of understanding made communicating and collaboration difficult.

To remedy the problem, Coleman decided to join his colleagues in the field. For seven months, he spent two days a week with various members of the Utility Services Department. This included joining pre-dawn shifts on garbage and recycling trucks, fixing leaks alongside water and sanitation crews, and accompanying staff as they went from house to house reading electric meters. The field work not only helped Coleman’s colleagues understand how the concept of sustainability applied to their jobs, it helped him find new ways to integrate sustainability into the utilities’ work.

“It allowed for a lot of time to talk with the front line guys, and the middle managers within the city, picking their brains about improvements that can be made, whether it’s water conservation or more efficient processes within their jobs. And I was able to let them know what I’m working on,” Coleman said. “That’s paid off really well just in establishing better relationships up and down the org chart within the city department.” Not to mention the fun Coleman had doing it. “I kind of enjoy that stuff anyway,” he said. “A desk job is fine, but it’s nice to be out in the field and getting dirty, so that’s pretty good.”

Using Professional Development to get a Seat at the Table. The Sustainability & Strategic Planning Office has a small budget, and its annual budgeting process is relatively simple; it usually requires no more than a day or two to complete. But with EECBG and other grant funding, as well as ambitions for a bigger budget in the future, Coleman understood that budgeting would be a necessary part of his own professional development.

“Working in the field) allowed for a lot of time to talk with the front line guys, picking their brains about improvements that can be made...that’s paid off really well in establishing relationships up and down the org chart.

— John Coleman
He asked to sit in on higher-level budget meetings in larger departments, including utilities. What began as an observer role—learning about the budgeting process and what goes into decisions about budget cuts and reallocations—soon became more participatory. In 2010, for example, when the department had to make capital improvement cuts to balance the overall city budget, Coleman helped spare a solar thermal dryer of bio-solids from being eliminated. The equipment diverts waste that would otherwise be landfilled, and it generates revenue as commercial grade compost. More importantly, though, what began as a professional development experience has turned into a seat at the budgeting table in a number of departments, allowing Coleman to advocate for sustainability funding before budgeting decisions have been finalized.

“It’s been really helpful to understand how those decisions are made and what kind of decisions have to be made in a budget crunch,” he said. “I think it makes for more well-rounded employees, too. Other department heads or staff members know that I’m thinking about more than just environmental issues—that I want to understand the process, and they’re more comfortable with me in meetings because of that.”

Engaging the Academic and Nonprofit Sectors. With a small staff and budget, completing all of the city’s sustainability projects alone would be a herculean task for the sustainability office. So the office has developed partnerships with a number of local and national nonprofits to help implement its programs:

- The Watershed Conservation Resource Center brought technical assistance and partnered with the city on an EPA grant to restore a 1,200-foot section of an urban creek, whose banks were rapidly eroding;
- The Treadwell Institute administers the $275,000 community revolving loan fund—a subsection of the EECBG grant—which helps local nonprofits become more energy efficient. Treadwell’s Director, Mikel Lolley, also facilitates the Green Economy Group of Fayetteville Forward, a community-based, collaborative economic development initiative led by the city;
- The University of Arkansas’ National Center for Reliable Electric Power Transmission (NCREPT) uses the library’s Solar Test Bed to research smart grid technology;
- The National Center for Appropriate Technology (NCAT) provides staffing, project direction, and management on the implementation of the Sustainable Cities grant.

“If you’re in a municipality… there are a lot of limits on what you can and can’t do,” said Lolley. “One of the beauties of working with nonprofits and volunteer groups is that you can be so much more nimble. They can work in the cracks and the margins where it’s too controversial for politicians and municipalities and chamber presidents to be. They can’t come out on the hard stuff, but the unencumbered and unaffiliated nonprofits and volunteer groups can, and working with them can get a lot of traction within the community.”

Fayetteville Forward—initiated by Mayor Lioneld Jordan and driven by community groups—has been particularly effective for engaging the community in sustainability-related efforts. “It’s been a great way for our elected officials, department directors, and community leaders to gain a clear vision of the community’s priorities,” said Melissa Terry, the Sustainable Cities Program Coordinator at NCAT.
Coleman admits that community engagement has been among his office’s biggest challenges, but he also identifies the nonprofit community as his strongest community ally. The recent Streamside Protection Ordinance illustrated the importance of nonprofit organizations in Coleman’s work. They helped organize dozens of public engagement meetings—many among groups that were hostile to the Ordinance because they viewed it as a threat to development—and helped make the case to the public. “That ordinance will go a long way toward protecting water quality,” Coleman said. “It was critical to reach the community in a way that was effective.”

Lessons Learned

*Start by listening, not with pre-conceived ideas.* Many of Fayetteville’s successes, particularly in energy efficiency, originated as ideas from other city employees—not from Coleman or his staff. The role of the sustainability director is often to give a voice to others within the organization, and to include a variety of different initiatives in the sustainability agenda. As with Coleman’s experience working alongside building services, paying attention to the challenges of other departments and employees can generate ideas for how to address them through sustainability initiatives. This builds trust, and helps to create a broader, shared vision of sustainability across the organization.

*Big policy change first requires small victories.* Coleman began his tenure by taking on major projects, such as writing a city-wide purchasing policy. While he felt the policy was strong, its success was limited because he hadn’t first achieved buy-in from the affected city departments. When he instead turned his focus to smaller initiatives—installing occupancy sensors in bathrooms, for example—and was able to demonstrate their success, he was then able to work with some of the same people on larger issues, such as the performance contracting. His advice: “Work on really small things in the beginning with much larger goals down the road. Don’t just jump straight to creating some policy that you think will have a huge impact because some other city has done it. You have to work your way into that, and in the long run it will pay off.”

*Build relationships up and down the org chart, not just at the top.* Authority ultimately rests with department heads and elected officials, making their support critical to achieving sustainability goals. But in city organizations of hundreds or thousands of employees, it is often the middle managers and field staff who have the ability to make the necessary changes, and their input is often overlooked. Understanding the work of these key individuals, and listening to their ideas can go a long way toward generating the momentum needed to make larger change.

*Use professional development to build relationships.* “I think a great way to gain traction with other department heads is to seek them out for some professional growth opportunities,” said Coleman. By taking advantage of internal expertise, and making the position more about learning and less about a single agenda, access comes far more easily. It also provides room for conversations outside of typical goals and responsibilities, which can open up new opportunities and ideas for partnership. Said Coleman, “By and large, people in those positions want to help you if they see that potential.”

*Thanks to John Coleman, Jeremy Pate, and Melissa Terry.*
*Case study written by Tom Wilson and updated by Josh Kelly, Institute for Sustainable Communities.*

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**For More Information**


Sustainable Cities Institute Fayetteville Pilot City Program: [http://www.sustainablecitiesinstitute.org/view/page/basic/blog/feature.blog/fayetteville_ar](http://www.sustainablecitiesinstitute.org/view/page/basic/blog/feature.blog/fayetteville_ar)

Fayetteville Forward website: [http://fayettevilleforward.accessfayetteville.org](http://fayettevilleforward.accessfayetteville.org)

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Identifying Risks and Vulnerabilities Through the Climate Adaptation Process

Introduction
The Huron River Watershed Council led a year-long program, known as the Making Climate Resilient Communities Program, to work with Huron River dam operators to identify the leading threats to the dam systems due to climate change. According to Mike Saranen, the full-time dam operator at Ford Lake Dam in Ypsilanti, Michigan, the leading concerns for dam operators are increased severe storm events, leading to high flow events and potential flooding, and increased periods of drought, which make maintaining water quality, pond levels, and river flow a challenge. In addition to identifying risks, the HRWC’s Making Climate-Resilient Communities Program works with dam operators to identify how they can address these risks. Through a series of educational sessions on the regional impacts of climate change, followed by an iterative process of discussing the vulnerabilities to dam operations in the context of these changes, the decision was made to focus on developing a communication network for the operators. Currently, communication between dam operators on the Huron River is weak to non-existent. This is due, in part, to the fact that there is no mandate requiring dam-to-dam communication so any effort are voluntary actions taken by the dam operators themselves.

Huron River and HRWC in Context
The Huron River Watershed Council was established in 1965 with the mission to “inspire attitudes, behaviors, and economies that protect, rehabilitate, and sustain the Huron River.” Today, the Huron River is the cleanest urban river in Michigan and HRWC is widely credited with providing the stewardship to make this possible. HRWC currently has nineteen active programs in the three core areas of watershed science, watershed management, and outreach and education. Beginning in 2009 HRWC has focused a portion of its outreach and educational campaigns on climate change in the watershed. The expectation of a warmer climate and more severe precipitation events places significant pressure on in-stream functions and the natural systems of the river.

The Huron River flows over 124 miles from Oakland County, MI to the mouth of Lake Erie. The main branch incorporates over 24 major tributaries and a significant portion of the water flow is the product of ground water flow from precipitation, snow-melt, and the adjacent aquifer. There are 17 impoundments on the main branch of the river and at least 97 dams in total over the whole system. Of the 17 impoundments on the main branch there are no less than 10 different private operators, each following their own compliance requirements, standard operating procedures and regulations per the Federal Energy Regulatory Commission (FERC), court order, or the State. In Washtenaw County alone, there are seven dams, on the main branch with four independent operators. Further complicating how dams are managed, there are a mix of manually operated dams and automated dams.

“Climate change is an exclamation point on existing needs.”
-Rebecca Esselman, HRWC, Watershed Planner

In December 2011 thirty people attended a kickoff event that hosted climate specialists and water system experts, including the state climatologist. Following this meeting the in-stream working group began a series of regular meetings. These meetings followed an iterative process of assessing the strengths and vulnerabilities of the current system given the expected impact of climate change. These meetings served to make climate change into a tangible subject for the sector representatives to think about and discuss. These meetings led to the in-stream flows team recognizing that the area they need address is an existing weakness in their system – up and down stream communication.
As the Huron River flows across Southeast Michigan, the health of the river has been impacted by the rise and decline of the manufacturing industry in the region, specifically the auto industry. Run off from urban development, wastewater from industrial sites, increased usage of the river as a direct water source, and depletion of the aquifer due to the increased number of wells have negatively affected the health of the river.

Building a Resilient Watershed
In 2011 HRWC received a one year grant to launch their Making Climate-Resilient Communities program. Through the program, HRWC began regular meetings of three sector groups to discuss climate impacts and identify adaptation strategies. Sectors included:

- Water infrastructure, for practitioners involved with water utilities, wastewater treatment facilities, stormwater management
- In-stream flows, for dam operators, fisheries biologists, and hydrologists
- Natural infrastructure, for land managers involved with land preservation, wetland restoration, and floodplains management

Through the program, HRWC sought to accomplish the following:

- Provide the most up-to-date predictions of how climate trends likely will impact the watershed, in general and specific to each sector;
- Explore participants’ programmatic capabilities to address climate change, and what activities and programs to plan for climate change are already underway in the watershed;
- Share best practices for addressing impacts from climate change in each sector and consider potential projects or initiatives that would be effective and feasible at preparing communities for climate change;
- Identify what participants need (resources, barriers removed, policies changed) to successfully implement these best practices, projects, and initiatives; and
- Create a training opportunity for peer organizations in Michigan to lead parallel efforts in their watersheds.

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Learning from Experience and Galvanizing Action
Saranen, who has fourteen years of experience as the Ford Lake Dam operator, attended all of the HRWC program meetings and intends to introduce the communication network concept to his peer operators over the coming months. As the dam operator of Ford Lake he has a unique perspective on the value of public communications about the river. Ford Lake Dam lies downstream from the City of Ann Arbor’s automated dam systems, whose operations has led to misunderstandings between the two regions. Misunderstandings have also spread downstream from Ford Lake to the manually operated French Landing Dam. In the 1990s, a breakdown in communications between Ford Lake and French Landing led to a flood event and strained relations between dam operators. Determined not to repeat past mistakes, the two dams now communicate on a daily basis to share information about flow and water quality to improve operations for both locations.
Saranen hopes that by calling attention to the anticipated impacts of climate change other operators will begin to see the value of a strong river-wide communication network. His hope is that this project will lead to an accessible and user-friendly method of communication that could eventually be built into the SOPs of the dam and impoundments along the river.

**Project Timeline**
December 2011: Thirty people attended the project kickoff that featured presentations from the project team, titled “Climate Trends in Michigan and the Great Lakes, Exploring the Interconnections of Water, Energy and Climate.”

January-July 2012: Over six months, each sector group convened for monthly meetings. During meetings 1 and 2, groups identify climate change challenges specific to them, and brainstormed strategies for addressing those challenges. During meetings 3 and 4, groups identified resources and timelines to implement those strategies. The groups will finalize summary documents with action plans for their respective communities during meetings 5 and 6, which will take place in November 2012.

**Challenges and Lessons Learned**
A key challenge to this project was framing the conversation about climate change. The meeting facilitators found that because they began by presenting the potential threats from climate change it took multiple meetings for the group to work back to identifying their communication network needs. Based on past experience working with community groups HRWC has taken care to develop strong messengers for this program. This means that the majority of the program, to date, has been educating and meeting with these representatives who will now be responsible for advocating the communication network to their colleagues. Through these efforts HRWC has developed strong messengers to help deliver the Making Climate-Resilient Communities program to the community.

**Process and Next Steps**
Fall 2012: All stakeholders from the watershed will reconvene in a plenary meeting to share their findings and explore common opportunities and challenges among the three working groups in the watershed. At this meeting the lead dam operators will roll out their suggestion for an in-stream communication network and begin soliciting volunteers to join the network.

End of project 2012: HRWC will convene a final meeting where the leaders from each sector, along with state and local policy makers, evaluate the project’s process and results, and develop an agenda for state and regional policy changes needed to facilitate adapting to climate change at the local level.

**Resources**
HRWC Making Climate Resilient Communities

Huron River Report, Winter 2009
Climate Change in the Great Lakes Region

There is a high level of scientific certainty that the climate has changed in significant ways in recent decades and that it will continue to change in the future. This is a summary of the potential changes and impacts of climate in the Great Lakes region from the best research available across many scientific disciplines.

Right: Ice and snow cover on Lake Superior. Photo courtesy of NASA.

Temperature
- Average temperatures increased by 2.3°F (1.3°C) from 1968 to 2002 in the Great Lakes region.
- By 2050, an average air temperature increase of 1.8 to 5.4°F (1 to 3°C) is projected.
- By 2100, an average air temperature increase of 3.6 to 11.2°F (2 to 6.2°C) is projected.
- Winter temperatures will likely experience a greater increase than the summer months.

Precipitation
- Projections of future precipitation vary widely.
- Annual average precipitation will likely increase or remain nearly stable.
- Winter and spring precipitation may increase more significantly.
- Warmer temperatures will lead to less precipitation falling as snow, and more falling as rain.
- Lake-effect precipitation may increase in some areas.

Extreme Weather Events
- The frequency and intensity of severe storms has increased, and current models suggest that this trend will continue as the effects of climate change become more pronounced.
- More severe storms may have a negative economic impact due to resulting damages and increased costs of preparation, clean up, and business disruption.

Water Quality and Stormwater Management
- Increased risk of droughts, severe storms, and flooding events may increase the risk of erosion, sewage overflow, lead to more interference with transportation, and more flood damage.
- Future changes in land use could have a far greater impact on water quality than climate change. The coupling of climate change and land use change could therefore result in even stronger effects in some areas.

Snow and Ice Cover
- Since 1975, the number of days with land snow cover has decreased by 5 days per decade, and the average snow depth has decreased by 1.7 cm per decade.
- From 1973 to 2010, annual average ice coverage on the Great Lakes declined by 71%.
- Snow and ice levels on the Great Lakes and on land will likely continue to decrease.
- Reduced lake freezing will result in more exposed water that could increase lake-effect precipitation.
- Earlier spring warming may decrease the length of the snow season and cause precipitation in some lake-effect events to fall as rain rather than snow.
Lake Temperature and Stratification
- Lake temperatures have been increasing faster than surrounding air temperatures.
- Both inland lakes and the Great Lakes will likely experience longer warm seasons.
- Warmer water surface temperatures may increase the stratification of the lakes, decrease vertical mixing in the spring-winter, and lead to more low-oxygen, “dead zones” and toxic algal blooms.

Fish and Wildlife
- Coldwater fish populations will likely decline in population as warmwater fish populations become more abundant.
- Overall biomass productivity in lakes and waterways could be reduced by lake stratification and increased frequency of hypoxic conditions.
- In general, many animal species may need to migrate north to adapt to rising temperatures, and increased evaporation rates may decrease total wetland area in the region, both of which may lead to additional stresses on some species.

Forests
- Climate change will likely have mixed effects on forests that vary based on the species involved and other factors.
- With increasing atmospheric CO2, forest productivity will likely increase until other impacts of climate change, such as increased risks of drought, forest fire, and invasive species present additional stressors to forests.
- As temperatures rise, the distribution and composition of tree species will likely shift northward.

Lake Levels
- Water levels in the Great Lakes have been decreasing since a record high was reached in 1980.
- Lake levels are rising and falling a month earlier than during the 19th century.
- Other factors, such as land use and lake regulations also affect lake level, however, and it is still unclear how much of the recent trend in lake levels may be attributed to climate change.
- Future projections of lake levels for the Great Lakes vary, though most indicate a greater decline in lake levels with increasing greenhouse gas emissions.

Water Availability
- Overall, the Great Lakes region is expected to become drier due to increasing temperatures and evaporation rates.
- More frequent droughts could affect soil moisture, surface waters, and groundwater supply.
- The seasonal distribution of water availability will likely change. Warmer temperatures may lead to more winter rain and earlier peak streamflows.

Agriculture
- The growing season will likely lengthen and positively impact some crop yields.
- An increased frequency and intensity of severe weather, increased flooding and drought risks, as well as more pests and pathogens will likely negatively impact crop yields.
- Water availability and quality will likely pose challenges for agriculture.
Energy and Industry

- Drier summers may lead to reduced hydroelectric output during periods of peak usage.
- Reduced water availability may interfere with some industrial operations.
- Warmer temperatures and more frequent heat waves will likely increase electricity demands, particularly in urban areas and during the summer months.

Transportation

- With increasing temperatures, damage to paved surfaces due to expanding and softening pavement is more likely.
- The most significant impact on roadways will likely be the increased risk of flood damage.
- Shipping lanes will likely be open earlier and longer due to reduced ice cover on the Great Lakes.
- Lower lake levels may lead to decreased depth of navigation channels and a reduction in the maximum loads carried by vessels.

Public Health

- Increased risk of heat waves and increased humidity may increase the number of heat-related deaths and illnesses.
- Increased frequency of flooding events may lead to watershed contamination, while warmer surface waters could mobilize pollutants in sediment and contaminate fish.
- Diseases such as West Nile virus and Lyme disease may become more widespread since carrier insects will be more likely to survive milder winters.

Tourism and Recreation

- Winter recreation and tourism are likely to suffer due to reduced snow cover.
- Many species of fish important to recreation are likely to decline while the populations of some warmwater species may grow.
- Increased lake contamination and decreasing lake levels may lead to less desirable shorelines, but increasing summer temperatures and a longer summer season, may increase demand for beaches and some summer activities.
- Winter tourism and recreation may decline as summer tourism grows.
THE ART OF COMMUNICATING RESILIENCE: ADDITIONAL RESOURCES

LINKS

CREATING AN EFFECTIVE COMMUNICATION AND ENGAGEMENT STRATEGY:

BOULDER RESIDENTS GET HELP FROM ARTISTS:
Models for Mainstreaming Adaptation

For the first ISC Resource Guide on Adaptation & Resilience, staff prepared case studies documenting the experience of practitioners from various disciplines in Seattle and New Orleans in implementing strategies that bolster climate resilience within the context of water supply planning, public works, land use planning and redevelopment. The full case studies are available on ISC's Sustainable Communities Leadership Academy website. This synopsis captures in brief the lessons learned as previously documented.

Seattle Public Utilities – Water Supply Planning
Few people might suspect that Seattle’s water supply is at risk. The city has long been known as a place of abundant water. For more than a century, it has met all its water supply needs with snow melt and rainfall from two mountain watersheds a short drive away. Despite this long history of ample water, Seattle Public Utilities (SPU), the city’s publicly-owned water utility, turned its attention to the potential water supply risks from climate change more than a decade ago.

**Hydrological Modeling.** Since 2002, SPU has collaborated with the University of Washington’s Climate Impacts Group on regional hydrological modeling—initial modeling suggested that under a moderate risk scenario, Seattle was projected to lose 13% of its water by 2050. SPU used the assessment as a basis for assembling a portfolio of adaptation strategies that could offset expected losses and make the city’s water supply more resilient to climate change.

**Looking for Effective Adaptation Options.** Since climate impacts were not forecasted to be severe before 2050, SPU looked most closely at “no regrets” operational options that could be implemented by the utility itself in the near term and without significant cost to its rate payers, such as drawing down water levels in a reservoir below typical operating levels.

Seattle Public Utilities – Flood Risk Management
Seattle experienced two of the most damaging storms in its history in 2006 and 2007. The first storm, in December 2006, produced intense rainfall over a single hour. The city’s natural and artificial drainage systems could not accommodate all the runoff that resulted, and water rapidly flooded streets and buildings.

Another record-breaking storm struck in December 2007, this time dumping nearly five inches of rain on Seattle in a 24-hour period. Again, severe flooding occurred throughout the city, with some properties having as much as four feet of stormwater in basements and on ground floors. Both incidents represented 100-year storm events (i.e. the rainfall released during each storm exceeded the amount the city would expect for a storm of its duration once every hundred years).

**Assessing the Increased Risk of Flooding.** SPU hired consultants to examine historic rain data collected at 17 rain gauges across the City and analyze whether the frequency of extreme precipitation events had increased. The analysis showed a “weak increasing trend...in the number of days on which 25-year or greater precipitation events are recorded by at least one gauge.” The conclusion was that every 3.2 years, SPU could expect a storm to produce a volume of rainfall exceeding 100-year or greater precipitation events somewhere in the city.

**Improving Data Collection.** SPU’s assessment of historic rain gauge data left no doubt that the utility should expand and improve the information it had available for analyzing localized precipitation trends. The utility added 11 new rain gauges to its network, locating them in places where robust
information about rainfall patterns was not yet available. It also improved procedures for gauge maintenance to increase the reliability of the record.

SPU also launched a new program to create better“eyes and ears” out on city streets when major storms strike. A new group of“storm observers”—utility planners and engineers who had no explicit emergency management responsibilities—were trained to go to specific sites during high intensity storms and prepare written notes and take photographs documenting what occurred.

**Tuning Up Pre-Emergency Planning and Emergency Response.** After the 2006 and 2007 storms, drainage managers at SPU decided the utility needed a more regularly-updated list of the locations in the city that were most vulnerable to flooding. Staff from across the utility—planners, engineers and field crews—now convene after every storm season to revise this so-called dynamic hot spot list, and continue improving their understanding of the types of storms that are of the greatest concern at each site (e.g. some spots flood during short, intense rain events; others during steadier, longer storms).

The updated hot spot list becomes a foundation for more strategic hazard mitigation and response planning. Sometimes, expensive retrofits of drainage infrastructure are needed, and little can be done in the short-term. In many cases, though, a simple increase in pre-storm maintenance, or a low-cost structural fix, such as building a redundant inlet, can significantly ameliorate the problem. Utility staff have also created a set of customized emergency procedures for each location. Each year, drainage managers brief SPU’s director about the hot spot list and the work being done at each location, elevating the attention to flooding at the highest levels in the organization.

**Regional Communications.** In the fall before each storm season, SPU jointly launches a multi-media educational campaign with many other nearby jurisdictions. A“Take Winter By Storm” website disseminates coordinated messages about the specific steps property owners can take to protect themselves and increase the resilience of their properties. Public service announcements featuring elected officials, and tips delivered by weather reporters during television weather forecasts also help educate residents about what they should do before and during storms.

**Remapping Flood Prone Areas.** In addition to raising the awareness of all Seattle residents about how to prepare for flooding, SPU wanted to bring more intensive public education to those neighborhoods where the risk of flooding is highest. To target its public outreach efforts in this way, SPU first needed updated maps of flood prone areas that took account of more recent data on precipitation and stormwater flows.

**Integrating Climate Impacts into Capital Project Planning.** “How climate change will affect flooding is not specifically known enough yet for us to make significant changes to our design standards for drainage projects,” says Gary Schimek, SPU’s Separate Systems Manager. In the meantime, though, SPU has made a push to increase consideration of flooding on a project-by-project basis.“We are trying to anticipate how new infrastructure will be affected when flooding does occur,” explains Schimek.“And we are looking at whether we can build individual projects for bigger storm events without substantially increasing our cost.”

**New Orleans Recovery and Redevelopment**
Addressing the scale of damage in New Orleans after Katrina has been no small challenge, but today the city has a state-of-the-art comprehensive master plan that will shape growth and development for the next 20 years. The plan promotes compact, mixed-use, energy efficient, neighborhood-oriented development, improved transportation, and many other strategies to support its three pillars of livability, opportunity and sustainability. Most importantly, the plan squarely addresses the main adaptation challenge for the city: its vulnerability to climate change and sea level rise, and the need for better protection from storms and flooding.
The plan recommends preparing for climate change by adopting standards and techniques to increase resilience, and by engaging the community in dialogue about risk and mitigation options. It also adopts a strategy referred to as “multiple lines of defense”—an integrated approach to flood control that calls for restoration of Louisiana’s coastal wetlands and other natural barriers, and structural strategies, such as levees. In a departure from the past, however, the plan also advocates learning to live with water, transforming it to an asset and integrating it in the urban landscape through canals and green infrastructure.

**Community Based Adaptation and Mitigation in the Lower 9th Ward.** In the wake of the storm, when the city’s planning process and resources remained at best unclear, many individual neighborhoods proceeded to develop their own recovery plans with the encouragement of the mayor. The Holy Cross district in the devastated Lower 9th Ward was one of those neighborhoods. Less than a year after the storm, the Holy Cross Neighborhood Association (HCNA), in partnership with Tulane University and other neighborhood organizations produced a sustainable restoration plan for the entire Lower 9th Ward. The resident-led effort represented the type of new civic engagement that is creating neighborhoods that are on the forefront of sustainability. The plan addressed four areas: urban design and the built environment, the economy, the environment and quality of life.

**Architectural Innovations to Create Safe Affordable Housing.** Developers and nonprofit organizations are building sustainable and affordable architectural model homes throughout the city. The houses incorporate high design elements (which have gotten a somewhat mixed response from area residents), as well as features that will make them safe, affordable and sustainable for low-income residents. The homes are modern, colorful and compact, using existing narrow lots. Taking a practical approach, the houses were elevated and built with accessible roofs for easy escape and rescue in the case of extreme flooding. One is a floating house—the first in the U.S.

**For More Information**


CASE STUDY: TORONTO, ON

Modes for Adaptation Planning
Toronto Climate Adaptation Planning

Toronto’s approach to climate adaptation planning has been an evolution with intent, driven, in part, by provincial and federal interest in climate adaptation and “triggering” effects of severe weather impacts in 2005. Additionally, Toronto consulted with cities already pursuing climate adaptation in Europe and the United States to stimulate its process. Toronto built momentum for climate adaptation policy and action on a tradition of “green” infrastructure development, heat event response plans, interest in sustainable energy use, and emerging global and regional concerns about climate change impacts. A rapid, city-wide, transparent climate adaptation planning process was initiated in mid-2007. The process culminated in April 2008 with the release of Ahead of the Storm: Preparing Toronto for Climate Change, Development of a Climate Change Adaptation Strategy. The strategy included a broad climate impacts risk assessment and recommendations for development of short and long-term climate adaptation strategies. Currently, Toronto is in an ongoing process of following-up recommendations from the Ahead of the Storm report.

TORONTO’S RATIONAL FOR ADAPTATION
“Projects that incorporate climate change considerations may be more costly than those that don’t, but the costs of not protecting against climate change could ultimately be much higher [emphasis added].”

(from “Ahead of the Storm”)
Background

As a “greening” city, Toronto has a history of linking urban environmental and sustainability goals with managing weather impacts. Since 1999, Toronto Public Health has coordinated a Hot Weather Response Plan. A heat alert is called when there is a 65 percent likelihood of excess mortality (i.e., more deaths than would be expected on a normal day) and an extreme heat alert when the forecast likelihood of excess mortality is at least 90 percent. The alert system is designed to ensure those most at risk from heat impacts—poor, elderly, or ill residents, and children—receive warnings. In 2003, Toronto’s City Council approved a 25-year stormwater management plan for dealing with surface water quality and quantity, sewage overflows, and habitat protection. The plan encouraged the use of so-called green solutions. By 2005, Toronto was using alternative infrastructure practices, including green roofs, downspout disconnection and rainwater collection programs, basement flood prevention, green open space, wetlands and riparian protection, and urban forests to better manage stormwater and preserve regional water quality. However, the city had not yet considered potential climate change impacts in a strategic manner as part of these kinds of initiatives.

Getting started. During the summer of 2005, Toronto had 41 days where the average temperature was over 30°C (86°F), almost three times the average number of hot days between 1961 and 1990. The City issued 8 heat alerts and 18 extreme heat alerts during those 41 days, limiting the number of heat-related deaths. Toronto Public Health estimates that, in an average year, extreme heat results in 120 premature deaths, and it predicts that heat-related deaths will double by 2050 and triple by 2080 based on climate change scenarios.

During particularly intense rainfall in August 2005, a storm washed out part of Finch Avenue, and caused flash flooding to creeks, rivers and ravines, eroding stream-banks and damaging trees and parks. More than 4200 basements were flooded. The damages to public and private property were estimated at $400-500 million—the most expensive storm in Toronto’s history. The Finch Avenue washout alone cost $40 million to repair.

Unlike other cities that have conducted local climate change vulnerability assessments (e.g. Chicago, New York City), Toronto inferred local impacts from available global and North American sources. Toronto then connected anticipated impacts across different climate emissions scenarios with actual occurrences of extreme weather including the 2005 events above. Putting this knowledge in the context of federal and provincial climate impacts assessments helped to bolster the case that climate adaptation planning was a necessity. From this body of evidence, the city began to link the kinds of actions that were prudent and viable for adapting to climate change. Toronto has not yet accomplished a finer-grain assessment of climate change impacts that would allow the city to draw a straight line between impacts on the city and what could be done about them. However, a risk assessment process is currently underway to create downscaled climate impacts models, develop a climate risk screening tool, and implement climate risk benchmarking pilot projects.

Process

Emerging climate change planning process. In June 2006, the City Council directed the Toronto Environment Office (TEO) to develop sustainable energy plans for Toronto for short (to 2010), medium (to 2015) and long (to 2030) time frames. In 2007, Toronto began to formalize its response to climate change, linking actions on green infrastructure, services, and sustainable energy use.

In February 2007, the City Parks and Environment Committee directed the Toronto Environment Office to initiate a process entitled, “Change is in the Air: Toronto’s Commitment to an Environmentally Sustainable Future – A Framework for Public Review and Engagement.” After a series of administration and public meetings this process culminated in a June 2007 release of “Climate Change, Clean
Air and Sustainable Energy Action Plan: Moving from Framework to Action, Phase 1. The Climate Action Plan was approved by the City Council in July 2007 with three overall strategies: mitigation, adaptation, and strategies that have both mitigative and adaptive benefits.

The Climate Action Framework directed that “a plan be established to reduce the negative impacts of unavoidable changes to climate that are already underway, including: extreme heat; more intense storms; floods and droughts; damaging insects; and newly introduced diseases.” It also specified that the adaptation plan should identify strategies for city operations and the community; identify action steps including budgets; ensure response mechanisms (such as the heat alert response program); identify the requirements for data collection and management and modeling; and incorporate stakeholders’ input, including all relevant city agencies.

Subsequently, TEO created the Toronto Adaptation Steering Committee to develop the adaptation strategy. The Steering Committee was comprised of all city departments identified as vulnerable to climate change. Besides executive and departmental coordination, other tasks included communicating with stakeholders and the public about the adaptation planning process via a series of Forums through spring 2008, and engaging provincial and Federal governments. The Clean Air Partnership (CAP), a local non-profit, also served on the Committee providing technical assistance on adaptation planning. Their involvement was, in part, based on a series of reports they had authored on urban vulnerability to climate change, including “A Scan of Climate Change Impacts on Toronto” (2006), “Cities Preparing for Climate Change: A Study of Six Urban Regions” (May 2007), and “Time to Tackle Toronto’s Warming” (June 2007).

In January 2008, the City Parks and Environment Committee (CPEC) heard from six Canadian adaptation experts about expected climate change impacts for Toronto and recommendations for how to prepare. CPEC saw presentations related to climate impact vulnerabilities on infrastructure, watershed management, environmental, economic and social systems, and public health as well as insurance risks. The meeting was held in the context of the Ontario Expert Panel on Climate Adaptation, which had been recently created to make recommendations about province-wide adaptation strategies. Additionally, the Climate Change Impacts and Adaptation Division (CCIAD) of Natural Resources Canada was in the process of developing a report “From Impacts to Adaptation: Canada in a Changing Climate 2007”, reflecting advances made in understanding Canada’s vulnerabilities to climate change during the previous decade.
Ahead of the Storm. In April 2008, Toronto released Ahead of the Storm: Preparing Toronto for Climate Change, Development of a Climate Change Adaptation Strategy in collaboration with the Toronto Adaptation Steering Committee, and the Clean Air Partnership. The report presented a detailed account of the environmental changes that would take place as a result of climate change and comprehensive explanations of how they would affect the city. It provided a rationale for incorporating adaptation into City of Toronto policies, programs and activities, described programs and actions already underway in the city that provide protection from climate change suggested short-term actions; and recommended a process for developing a long-term strategy.

“While stopping the release of greenhouse gases remains our first priority, it’s apparent that some degree of climate change has already begun. In developing an adaptation strategy, the City of Toronto is taking steps to prevent negative impacts associated with the realities of a changing climate while proceeding with actions designed to combat further change.”

- MAYOR DAVID MILLER
(from Ahead of the Storm)
With a number of resilience efforts underway, the report recommended two concurrent streams of activity: (1) a series of short-term actions to build on existing programs that would reduce vulnerability to climate change in specific areas, and (2) a nine-step process that would guide the development of a comprehensive long-term climate change adaptation strategy for the city. The city identified a set of short-term actions for 2008-09 that had already been funded, including future climate prediction modeling to improve information on climate impacts, vulnerability and risk assessments for city operations, and an analysis of where green roofs could be most effective (which informed a subsequent new Green Roof by-law). The plan for developing the long-term comprehensive adaptation strategy included a three-year timeline and an emphasis on the importance of prioritizing risks. The plan detailed a nine-step process for creating the comprehensive strategy and included recommended actions for each step of the process.

The city also partnered with the Canadian Institute for Catastrophic Loss Reduction (ICLR) to develop an extensive online “municipal Reference Collection on Climate Change Adaptation,” complete with more than 300 issue-specific documents.

In April 2009, the city collaborated under the Toronto Urban Climate Change Network (TUCCN), to convene the event, “Not Business As Usual”, A Forum on Infrastructure and Climate Change Adaptation.” The purpose was to foster integrated approaches to bolstering the resilience of infrastructure. The forum goals included exploring the potential climate impacts on critical infrastructure, how to assess risks and impact (particularly from extreme events), best practices, innovative means to develop the adaptive capacity of infrastructure, and areas of greatest need for further research and decision support.

The TUCCN was originally formed to increase cooperation on adaptation research and advocacy in the metro region, by promoting professional cooperation, research, and policy development necessary for decision makers, and identifying research priorities based on the needs of decision makers.

**Lessons Learned**

Toronto has learned a number of lessons during its adaptation planning process similar to other adaptation oriented cities in the United States. Among the crucial components are mayoral and engaged city leadership, a reliable source of scientific and technical information, buy-in from city departments, secured sources of funding, and transparent public engagement and capacity building leading to the elaboration of a comprehensive strategy. Toronto immediately saw that emissions mitigation and adaptation activities would be complementary (e.g. green roofs, urban forestry, water conservation; see Venn diagram on p. 43).

**RECOMMENDATIONS FOR INTEGRATING ADAPTATION INTO EXISTING PROGRAMS**

Toronto’s Ahead of the Storm Report cited examples of existing City programs, plans, strategies, and assessment procedures that reduce vulnerability to climate change, and recommended that these include considerations and explicit goals for adaptation from now on:

- Toronto’s Official Plan
- Toronto’s Heat Alert System And Hot Weather Response Plan
- Transit City Plan
- Construction Programs
- Wet Weather Flow Master Plan
- Basement Flooding Protection Subsidy Program
- Flood Warning Forecasting Emergency Plan
- Green Roof Pilot Incentive Program
- Urban Forest Management Plan
- Parks, Forestry and Recreation Strategic Plan
- Green Parking Lots design guidelines
- The Deep Lake Water Cooling (Enwave), Peaksaver, and Keep Cool Programs (Toronto Hydro)
- Green Development Standard
- Better Buildings Partnership
- Environmental Assessments of New Capital Projects
- Long Term Fiscal Plan
- Green Economic Sector Development Strategy
Additionally, Toronto recognized the value of incorporating climate adaptation into already ongoing green infrastructure projects as a way to integrate climate adaptation from the start into city operations (see sidebar). Unlike some of their counterparts in the United States, however, Toronto was able to take advantage of preexisting provincial and federal activity on climate adaptation. Additionally, Toronto reinforced its adaptation activities via the Toronto Urban Climate Change Network.

The following lessons learned are adapted from Climate Change Adaptation in the City of Toronto: Lessons for Great Lake Communities by Jennifer Penney of the Clean Air Partnership:

*The importance of diverse champions.* Initial and continuing political and executive support is essential for the initiation, development and implementation of a comprehensive climate change adaptation strategy. Champions may emerge independently at the political or executive level, but more often, it takes a determined effort by staff or by external organizations that raise awareness of climate change impacts, make available credible information in plain language, and actively lobby for the development of an adaptation strategy.

*Don’t reinvent the wheel.* Consult an available guide on climate change adaptation planning for local governments, to help in developing a clear process and avoid “reinventing the wheel.” [See resource list for examples.]

*Assign, empower, and develop staff.* Establish an interdepartmental team to work on climate change adaptation. Ensure that the team has:

- A clear mandate for its work
- Participation by key policy and program staff
- Allocation of staff time
- A regular meeting schedule
- A reporting structure that ensures appropriate and timely responses from decision makers
- Training and capacity building opportunities
- Smaller working groups that can take on analysis and planning for key risk areas

“Toronto has taken advantage of shared knowledge and experiences from other Urban Leaders partner cities in the U.S., incorporating the best practices and most successful organizational approaches we have observed.”

- DAVID MACLEOD
  Climate Adaptation Lead,
  Toronto Environment Office

It takes time and a concerted “inreach” effort to have the key departments understand what adaptation is, why it is necessary, and to get them to incorporate climate change into their thinking and planning. An explicit strategy of communications and engagement with staff is advisable.

Organize internal workshops and learning events to get staff familiar with the concept of climate change impacts and adaptation.

Finally, maintain a strong and focused climate change adaptation team to oversee the work of integrating adaptation strategies into different policies and departments.

*Leverage existing resources.* Take advantage of the growing number of external conferences, workshops, seminars and webinars to introduce staff to issues related to climate change impacts and adaptation.

Ensure availability of on-line resource/reference collections to become more informed about existing knowledge and best practices.
Initiate or join the efforts of others in the region to get a better handle on climate trends and regional climate projections.

Great Lakes communities should make use of the deep layer of existing expertise in the region on climate impacts and adaptation. Mobilize external resources and expertise by:

- Identifying local experts who would be willing to provide information and advice
- Establishing an Expert Panel or Advisory Committee with expert participation to provide input into vulnerability assessments and adaptation planning
- Inviting experts to comment on draft plans and strategies
- Utilizing local experts to conduct workshops or participate in working groups and contribute to building the capacity of staff
- Participating in available peer networks such as the Alliance for Resilient Cities

Build on what you have. Identify the actions that the municipality is already taking that reduce the risk of current extreme weather, and that are likely to provide some protection from future climate change. This can provide a foundation on which to build a stronger, more comprehensive adaptation strategy.

Starting a vulnerability assessment may be easier than you think. Use available resources to undertake a quick initial scan of vulnerabilities for your community to increase awareness of climate change impacts and the need to take action on adaptation. A review of recent extreme weather events, as reported in the local press, may provide useful indicators about impacts, costs and vulnerabilities. Later in the adaptation process, a more specific and detailed analysis of vulnerabilities may be necessary.

Engage stakeholders early. Prepare and release an issues paper or framework document that outlines the expected impacts of climate change and how to prepare for them, in order to engage staff, Council members and the public in thinking about the issues and the decisions that need to be made. If possible, engage a broad range of staff and other potentially affected stakeholders in reviewing and contributing to the document. Ahead of the Storm provides an outline that may be useful for other communities to use in developing their own framework documents.

The role of outreach. Education is necessary to inform the public about local climate change impacts and to help them understand adaptation actions that can be taken at the level of the individual household, and in the municipality. Public consultation on climate change adaptation strategies can work both to increase awareness of local climate change impacts, and also to build support for necessary actions.

Consider multiple time frames. Adaptation planning needs to include short-term actions, longer-term planning processes, the implementation of upstream preventive measures and emergency preparation and response. Adaptation planners need to consider how to include and balance this range of activities.

It takes time to develop a municipal adaptation plan. Some short-term actions can be identified and acted on fairly quickly, but these should not substitute for longer-term assessment of vulnerability, priority risks and the effectiveness of different adaptation options.

Pursue no regret strategies. The goal of overall environmental sustainability should inform climate change adaptation strategies. Adaptation options and strategies that increase greenhouse gas emissions or contribute to other environmental and social problems should be avoided.

Written by Josh Foster, Center for Clean Air Policy
For More Information

Toronto’s Climate Change, Clean Air and Sustainable Energy Action Plan website, http://www.toronto.ca/changeisintheair
Within the Action Plan website, see in particular:

- Toronto’s Sustainable Energy Plan, June 2007
- Highlights/Moving from Framework to Action Phase 1, June 2007
- Staff Report, Moving from a Framework to Action, June 2007

Toronto Climate Change Adaptation website, http://www.toronto.ca/teo/adaptation.htm
Within the Adaptation website, see in particular:

- Climate Adaptation Experts Meeting website (includes presentations)
- Ahead of the Storm documents
- Climate Change Adaptation Staff Report, May 2008

Toronto’s Steps towards Climate Change Adaptation, Presentation for Alliance for Resilient Cities (ARC), January 20, 2009, David T. MacLeod, Toronto Environment Office.

Toronto Urban Climate Change Network (TUCCN) website, a network comprised of Toronto’s leading government, academic, and environmental organizations involved in the research of climate change specific to the Greater Toronto Area.
http://www.tuccn.org
Related Toronto Programs:

- Toronto Water website, including water efficiency and stormwater programs http://www.toronto.ca/environment/water.htm

Third Party Reports

- Time to Tackle Toronto’s Warming: Climate change adaptation options to deal with heat in Toronto, Clean Air Partnership, June 2007. http://www.cleanairpartnership.org/reports_time_to_tackle
Grand Rapids, Michigan: Linking Sustainability to Performance

by Danielle Goodwin

The International City/County Management Association (ICMA) identifies “building sustainable communities as a core responsibility of local government.” Likewise, ICMA asserts that local governments should use performance data for establishing goals and outcomes in budget decisions, setting targets of performance, learning from other jurisdictions, and making improvements to government finances.\(^1\) Many local governments take small and large steps towards building a more sustainable community through the use of performance management, but the city of Grand Rapids, Michigan took performance management and sustainability a few steps further. Not only has the city used performance data to track and manage progress made on sustainability efforts, but the city institutionalized both sustainability and performance management through the help of businesses and residents of the community and by budgeting for sustainability outcomes.

Utilizing performance management to establish sustainability goals and outcomes is no easy task. One of the most difficult challenges for local governments is acquiescing on the meaning of sustainability. There are many local governments who define sustainability through a narrow perspective, typically focusing on environmental goals and outcomes, but the more holistic approach to identifying sustainability is focused on environmental integrity, economic prosperity, and social equity. While the approach to building sustainable communities varies, the city of Grand Rapids, Michigan has taken a bold step by making its FY 2011 to 2015 sustainability plan the “umbrella plan” for all other plans, ultimately institutionalizing sustainability. In short, the city of Grand Rapids uses the sustainability plan’s outcomes to prioritize budget allocations.

“The annual budget is developed within the context of a five-year plan. The city is transitioning to a planning and performance measurement process that is inclusive of all city services. It measures achievement of outcomes in relation to sustainability principles called the triple bottom line—economic prosperity, environmental equity, and social equality. What once was known as the city of Grand Rapids’ strategic plan has evolved into the city of Grand Rapids’ Sustainability Plan.”\(^2\)

After the first year of implementing the sustainability plan, 92 percent of the sustainability targets have been completed or are in progress. What has contributed to the city’s success? While several factors play a key role in the city’s success thus far, this case study will focus on the following:

- Involving staff in creating a target driven sustainability plan
- Prioritizing the budget around sustainability outcomes

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**Case Profile**

Population: 189,815
Square miles: 44.40
Median household income: $38,344
Form of government: Commission-Manager

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For more information on the city of Grand Rapids, Michigan sustainability plan or any other topics discussed in this case study, please contact Haris Aibašić, director of the Office of Energy and Sustainability for the city of Grand Rapids, Michigan at halibasic@grcity.us or visit the www.sustainablegr.com website.
Background
As the second most populous city in Michigan, Grand Rapids has been evolving rapidly over the past ten years. Much of this progress has been attributed to the city’s focus on economic, social, and environmental outcomes or, as the city calls it, their sustainability plan. Grand Rapids Mayor George Heartwell and the Community Sustainability Partnership (CSP) initiated sustainability efforts in 2005, which helped lead to the creation of the city’s first sustainability plan. The CSP “is a diverse network of for-profit and nonprofit organizations in West Michigan that supports sustainability in its planning and operations, and is striving to make a positive impact in its community. Members of CSP have committed to work together to restore environmental integrity, improve economic prosperity, and promote social equity, or the ‘triple bottom line.’” Since the launch of CSP, more than 200 organizations have joined the partnership with almost 70 percent private sector partners. The citizens and businesses and community-wide support for and commitment to Grand Rapids’ sustainability efforts have given rise to many national awards and recognition. Such honors include:

- 2012 U.S. Conference of Mayors Climate Protection Award in the large cities category
- 2010 U.S. Chamber of Commerce Civic Leadership Center and Siemens Corporation—Grand Rapids the nation’s most sustainable mid-size city
- 2007, the city was recognized along with the Community Sustainability Partnership by United Nations University as the first regional center of expertise in education for sustainable development in the United States
- First city in Michigan to have a LEED certified government building facility
- One of the top 20 Green Power purchasers [For more information check the following web site: http://grcity.us/enterprise-services/officeofenergyandsustainability/Pages/Achievements.aspx

Involving Staff in Creating a Target Driven Sustainability Plan
In 2006, the city of Grand Rapids, Michigan created the city’s first sustainability plan, utilizing the triple bottom line approach (goals of economic prosperity, environmental integrity, and social equity). The first sustainability plan served as a blueprint. However, the FY 2010 to 2015 sustainability plan is more robust and serves as a target driven and goal oriented plan. The city’s sustainability plan is considered one of the most innovative in the nation with specific environmental, economic, and social sustainability outcomes and targets as goals for all city departments connected directly to the FY2011 to 2015 fiscal plan. The layout of the plan is simple; 14 goals, 40 outcomes, and 214 targets. The targets are the foundation of the entire sustainability plan, as these are the immediate measures of success. Haris Alibašić, the director of energy and sustainability, stated that the city did not want to only report on sustainability indicators, like most cities, but instead they wanted to take it a step further and report on actual targets. He continued to say that targets add a measure of accountability and ownership, as various city staff across the organization become outcome champions of specific targets in the sustainability plan.

As most local governments know, developing performance measures and targets is no small task. Government leaders in the city of Grand Rapids decided to involve staff throughout the creation of the sustainability plan especially during the target creation phase. When measuring employees’ performance, a top-down approach can be looked at as unfavorable by staff. Establishing targets without staff engagement can result in staff opposition or failure to reach the desired outcome. Not only did the city of Grand Rapids engage staff in the target setting process, but they involved staff early in the planning process. During the development phase of the sustainability plan, the staff who would be held accountable for reaching the targets set forth in the plan was the ones directly involved in creating the targets. By allowing staff to craft aggressive, yet feasible targets for the plan, they would not only be held accountable for meeting those targets, but they would also take ownership in the plan. Furthermore, by reporting on actual targets and having staff involved in the planning and implementation phases of the plan, individuals are able to own their accomplishments and see real progress. Haris Alibašić believes staff
involvement in the creation of the plan is one of the reasons the plan has been successful thus far. As Mr. Alibašić added, these targets have performance measures that are both quantified and qualified. The first year report of this five-year plan showed departments had met 24 percent of all targets, and another 68 percent of the targets are in progress and moving the city closer to fiscal, social, and environmental sustainability. [Source: http://grcity.us/enterprise-services/officeofenergyandsustainability/Documents/Year1ProgressReport.pub.pdf]

**Prioritizing the Budget around Sustainability Outcomes**

As a way to further prioritize sustainability, the city of Grand Rapids implemented a priority-based budgeting system, where the budget reflects the outcomes and priorities set forth by the sustainability plan. This system is unlike the traditional budgeting process “where governments start with funding levels by department from the previous year and then adjust by either increasing or cutting, no longer meets the needs of many organizations.” For the creation of the city’s budget, department directors are required to adjust their upcoming fiscal year’s estimated revenues and their appropriation request to desired services outcomes by preparing a “proposal for outcomes” for each major service. The package typically includes direct and indirect costs as well as comments regarding the prior year’s outcomes. It should be noted that because Grand Rapids approaches sustainability holistically, all city departments are responsible for outcomes and targets outlined in the plan.

Aligning department revenue and appropriations to the goals, outcomes, and targets of the sustainability plan helps ensure the following:

- Funding goes directly to priorities set forth by the city in the sustainability plan
- Government leaders and mid-level managers can oversee and direct performance
- Staff are held accountable and are given ownership for meeting the appropriate targets; and help to eliminate funding shortages for targets not being met
- The city is held accountable to residents and community.

**Conclusion**

The city of Grand Rapids has taken a progressive approach to sustainability planning. The city has replaced their strategic plan with the sustainability plan, used targets and goals to accomplish its sustainability objectives, involved staff early during the planning process of the sustainability plan, especially when identifying performance measures, and linked sustainability outcomes and targets to the budget. The city utilized the triple bottom line approach to sustainability, which is to improve environmental integrity, enhance economic prosperity, and promote social equity. While not all local governments are going to find Grand Rapids approach to sustainability viable, the important take away from the approach is how the city developed targets and measures and linked them to the budget. After one full year of implementing the 2011 to 2015 sustainability plan, the city has either completed or is in progress to complete 92 percent of targets. Staff accountability and ownership of sustainability targets, as well as sustainability goals and targets linked to the budget are two major contributors to the success thus far.

**Notes**

3. http://www.grpartners.org/about

Complete data set, comments, and chapter PDFs are available only to CPM participants at http://icma.org/cpm. For information about CPM, please visit http://icma.org/performance.
MAINTREAMING ADAPTATION IN THE COMMUNITY: ADDITIONAL RESOURCES

LINKS

CHICAGO CLIMATE ACTION PLAN - MODEL FOR ADAPTATION

FLAGSTAFF CITY WIDE RESILIENCE STRATEGY

SUSTAINABLE CLEVELAND 2019
http://sustainablecommunitiesleadershipacademy.org/resource_files/documents/Cleveland,%20OH.pdf

INTEGRATING CLIMATE CHANGE INTO THE TOWN OF AJAX OFFICIAL PLAN
http://www.cleanairpartnership.org/files/Ajax%20Final.pdf

ANN ARBOR SUSTAINABILITY FRAMEWORK
Building A Stormwater Utility

Project Snapshot
In 2006, the City of Ann Arbor updated the rate structure for its stormwater utility to charge property owners based on the amount of impervious surface on their property. The new, more equitable rate structure includes incentives to manage stormwater onsite. The utility, which generates over $5 million per year, funds operations and maintenance projects for the stormwater system, water quality improvement projects, stormwater education, implementation of environmental regulatory or remediation plans, and green infrastructure projects that reduce strain on the stormwater system.

Utility Details
Until 2006, the City of Ann Arbor’s stormwater utility, which began in 1984, charged residential property owners a flat rate. The City looked to update the utility in order to meet expanding service needs, employ new technologies to improve the system, and comply with evolving regulatory requirements. Specifically, in Bolt v City of Lansing (1998), the Michigan Supreme Court struck down Lansing’s stormwater utility and established three utility rate design requirements:

- Fees must serve a regulatory and not revenue-generating purpose.
- Fees must be proportionate to the necessary cost of service.
- Property owners must be able to refuse or limit their use of the service.

Ann Arbor’s utility and rate structures are designed to meet these criteria. First, all services are regulatory and fulfill National Pollutant Discharge Elimination System (NPDES) permit and National Flood Insurance Program (NFIP) obligations. Second, cost allocation and rate-setting processes ensure that costs are proportional to the fees charged. Third, residents and businesses can reduce their use of the service (and therefore their rates) by reducing the amount of impervious area on their properties. Properties that flow directly into the river are exempt because they do not use the City’s stormwater system. In addition, the City offers a series of credits that reduce rates. Achieving “RiverSafe Home” certification or installing rain barrels, rain gardens, or detention basins lead to lower rates for property owners. Commercial credits include installing detention basins, following water quality best management practices, and achieving “Community Partners for Clean Streams” designation.

Ann Arbor, MI
Population: 113,934
Governance: Council-Manager

What is a stormwater utility?
The Michigan Department of Environmental Quality defines a stormwater utility as:

“[a] source of funding the construction and maintenance of stormwater management facilities. User fees are typically charged based on the amount of runoff that may be anticipated from a property.”

Funding

Setting up the new rate structure carried significant cost because it required detailed information about each parcel and the City’s overall impervious area. These measurements are based on flyover maps; Ann Arbor’s most recent flyover map cost about $50,000. Although setting up a utility has high upfront costs, it brings in enough revenue to administer the program once it is operational. In 2010, Ann Arbor’s utility generated nearly $5.3 million in revenue.

Utility Cost Per Parcel

<table>
<thead>
<tr>
<th>Single-Family and Two-Family Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured impervious area</td>
</tr>
<tr>
<td>Quarterly charge*</td>
</tr>
<tr>
<td>Up to 2,187 square feet</td>
</tr>
<tr>
<td>&gt; 2,187 to 4,175 square feet</td>
</tr>
<tr>
<td>&gt; 4,175 to 7,110 square feet</td>
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<td>&gt; 7,110 square feet</td>
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</tbody>
</table>

* Plus a $6.77 customer service charge per quarter.

Commercial and other properties (e.g., multi-family, office, institutional, and industrial land uses) are billed directly on the impervious areas at a rate of $342.00 per acre per quarter, plus a $6.77 customer charge per quarter.

Results

In addition to operations and maintenance of the stormwater pipes, the utility has provided funding for diverse projects that reduce strain on the system. Sample projects include installing a permeable concrete alley in a residential neighborhood, creating a wetland preserve in a public park, building underground detention basins, and operating the City’s urban forestry management program. The City has granted over 5,000 credits to residents and businesses for actions that reduce strain on the stormwater system.
Case Study: Ann Arbor, MI | 42

Left: Concrete alley in residential neighborhood

Right: Permeable material in Ann Arbor alley

Advice for Communities Considering a Similar Project

Start with education – Laying the education groundwork and making sure the community understands the connection between rainfall and water quality is a crucial first step before setting up a stormwater utility. Fostering a connection to the river or lake where the stormwater goes forms the basis for peoples’ willingness to pay for stormwater system improvements because they understand the water quality benefits. Partnership opportunities can begin with the public schools for stormwater education. “Watershed” and “Runoff” are part of the Michigan Educational Assessment Program (MEAP) standards. Ann Arbor Public Schools has an urban hydrology program for 2nd through 6th grades.

Empower residents to make a difference – The rate structure gives residents an opportunity to use their property to improve water quality and get recognized for their efforts. These residents can then become ambassadors to their neighbors about the benefits of rain barrels, rain gardens, and other strategies to manage stormwater onsite.

Use high-quality data – Investing in technology to have accurate flyover data helps ensure that rates are fair and minimize disputes. GoogleEarth does not provide enough detail, in part because the flyover should happen during leafless conditions. Ann Arbor uses six-inch pixels and updates its maps every three years. The maps (and the cost for generating them) are shared with other City units.

Emphasize transparency – Through the City’s website, residents can see an aerial photo of their parcel with impervious areas marked and the calculations the City used to determine their rate. The site outlines a process for property owners to dispute the City’s calculations if they believe there are errors in the aerial photograph or interpretation. After visiting the property in question, field staff make corrections and adjust rates if necessary.

Leverage partnerships – The City of Ann Arbor, Washtenaw County, and the University of Michigan all own and operate portions of the stormwater system within city limits. Ann Arbor has kept program costs low and streamlined administration by partnering with the County Water Resources Commissioner’s Office on stormwater improvement projects, education and outreach programs.

Raise the bar for municipal operations – Ann Arbor works to integrate best practices for stormwater management into its own operations as well. For instance, a newly constructed Municipal Center is an example to the community that includes a rain garden, cistern, infiltration beds, green roof, planter boxes, and permeable pavers in the parking lot to achieve a net zero runoff from the site.

For More Information

A copy of the flyover mapping RFP is available at MichEEN.org under the Michigan Green Communities group.

Visit a2gov.org/storm for more information on rate structure, available credits, and more.

Original case study developed by Laura Matson at Michigan Green Communities. For questions or information, visit greenchallenge.mml.org

Presentation on raingardens and understanding storm water: http://www.a2gov.org/government/publicservices/systems_planning/waterresources/Documents/systemsplanning_stormwater_raingardenguide_2008_05_05.pdf
Insurance Industry Takes Steps to Address Future Climate Impacts

The insurance industry, like cities across the United States, is grappling with how to deal with the projected impacts of climate change. While climate change represents potential new business opportunities for the industry, extreme weather events also pose a huge risk, not just to property insurers, but to health and life insurance providers too.

The success of the insurance industry depends on successfully anticipating and managing risk. The industry is, therefore, keeping a close eye on climate forecasts. Insurance companies have also taken steps to mitigate future climate impacts by reducing greenhouse gas emissions, though there is a growing recognition that because of the need to reduce risk in the short term, adaptation is actually far more relevant to the industry than mitigation. Some insurers are promoting greater resilience to climate-related events by providing incentives to homeowners to retrofit their houses in ways that protect against future storm damage.

But for the most part, the actions that insurance companies are taking today are based on models of historic climate patterns, not the new climate projections. Adaptation planning is challenging for insurers for a number of reasons:

Adaptation varies by location. The way that insurers respond to climate risk depends on the type of hazard they have to account for, which varies considerably across insurance markets. The risks in coastal communities, for instance, are very different from, say, those in the Midwest. So it’s impractical to think about a national or industry-wide response. Also, insurance is regulated at the state level, making for inherently varied approaches to dealing with the future risks of climate change.

Time horizons. Most insurance companies write policies on an annual basis. Premiums, deductibles and coverage limitations are determined based on sophisticated models and actuarial science that factor in historical data. These models are not currently designed to account for climate projections. But even if they were altered, the insurance policies couldn’t be easily rewritten because of regulatory restrictions that protect consumers from dramatic rate increases.

Public insurance. There is a significant policy debate underway about the role of public insurance pools in insuring against economic losses in hurricane-prone and other vulnerable areas. Several federal bills, currently under consideration, could affect the balance of public and private responsibility.

The issue is also playing out at the state level. Florida in particular is having a vigorous debate about the Florida Citizen’s Property Insurance Corporation, a state insurance pool. In the interest of promoting fair and affordable insurance coverage, Florida set a cap on premiums, which resulted in many private insurers leaving the market. The state program is now deep in debt from the number of claims that it has had to pay out. There are also questions about the state’s ability to pay future claims in the event of another major catastrophe. Florida wants a federal guarantee for the state...
program, but private insurers oppose the idea, arguing that the state program is artificially holding down premiums for coastal property owners. The state is under pressure from residents and businesses to keep rates affordable, but industry and environmental interests argue that the current rates encourage people to build and live in places that are unsafe, and that this behavior unfairly spreads the cost of insurance to people in non-coastal areas.

Despite these issues, some of the major insurers and reinsurers are taking steps to work with partners on climate adaptation and are discussing how to incorporate risk into their underwriting practices. Reinsurers, who take more of a global perspective, have been looking at adaptation in non-US markets, and are increasingly seeking ways to bring lessons from abroad to bear in the United States. So far the overall industry has a relatively shallow engagement on the adaptation side of climate change, but that is expected to change. Major players are taking the lead, and part of the role they see themselves taking is educating some of the smaller and medium sized companies. Industry leaders say that ultimately the answer is not to insure against risk, but to work with communities and government partners more effectively on risk management, so that hazards are manageable and, therefore, uninsurable. Some of the ways the industry is helping to advance local adaptation planning include:

**Research.** There is a fair amount of research underway to better understand the risks and possible impacts of climate change, and how the insurance industry can respond. The Economics of Climate Change Working Group, an international consortium which included foundations, private sector companies and international agencies, looked at cost-effective adaptation measures in several vulnerable regions of the world including South Florida. Members of the Working Group briefed Florida insurance commissioners and business leaders on the findings from their analysis, designed to help inform the local insurance debate and identify some potential solutions.

**Assisting state/local government adaptation planning efforts.** The state of Connecticut launched a comprehensive climate action planning initiative, led by the Governor’s Steering Committee on Climate Change (GSC). The GSC formed an adaptation subcommittee that is assessing the impacts of climate change on Connecticut’s infrastructure, natural resources, public health, and agriculture, and developing recommendations for changes to programs and laws that would enable state and local government to adapt to such impacts. The state’s insurance regulatory agency is participating in the subcommittee.

The state also reached out to Swiss Reinsurance Company, a reinsurer with significant business interests in the state. Mark Way, Director of Sustainability Development for the Americas Risk Management Division of the Swiss Re, says his company was approached to provide advice and expertise to help frame the subject and help the subcommittee members think about the impacts of their decisions in the context of economic loss mitigation. His company also played an advisory role in the adaptation planning efforts of the New York City and the State of New York.

**Tools and education.** CERES, a national network of investors, environmental organizations and other public interest groups working with businesses on global sustainability issues, argues that the insurance industry can be a critical voice in finding solutions to the challenge of climate change. CERES is working with stakeholders to find meaningful ways to think about and manage risk. CERES is also educating state insurance regulators and working with federal agency partners and the Community and Regional Resilience Initiative (CARRI, one of eight NOAA-funded Regional Impact and Science Assessment programs) to develop more robust risk assessment tools.

**Advocacy and policy.** The Smarter Safer Coalition brings together consumer advocates, insurance industry representatives, environmental advocates and emergency management agencies to promote safe, environmentally responsible, fiscally sound approaches to natural catastrophe policy. The coalition supports a federal government role in encouraging and helping homeowners to undertake mitigation efforts to safeguard their homes against hurricanes. They are fighting policies
that, in their view, would provide unfair subsidies for insurance of coastal residential properties. The Coalition’s position is that such policies encourage people to build houses in hurricane-prone, environmentally sensitive areas. Smarter Safer has also developed a statement of principles regarding approaches to building in such areas.

Insurers are important partners for cities in mitigating economic losses to communities, businesses and individuals. While the insurance industry continues to identify ways it can respond to the challenge of global climate change, cities can take steps today to work with their insurance partners:

• In a process that is already underway in many places, one of the first steps is to identify key local hazards and potential risks.

• Start the conversation about how to better manage risk by identifying the key insurance and reinsurance entities serving the local community, and reaching out to them. Some of the larger companies could be helpful resources and partners in developing a local climate adaptation strategy.

• Look to how other cities have engaged the insurance industry in their efforts in order to learn from others’ experiences.

Written by Betty Weiss, Senior Program Advisor to the Institute for Sustainable Communities

For More Information


CASE STUDY: MILWAUKEE, WISCONSIN

Building a Cluster of Water Innovation in Milwaukee
A Natural Asset Becomes the Driver for Economic Development

Background

Milwaukee is a Native American word meaning “Gathering Place by the Water.” The Milwaukee region’s location on the shores of Lake Michigan has both shaped its history and promises to build its future through an innovative multi-sectoral partnership that is making the city an internationally recognized “World Water Hub” for freshwater research, education, and economic development on an unprecedented scale.

21% of the world’s fresh water lies in the Great Lakes, and almost 3% (nearly a million acres) of Wisconsin’s area is made up of lakes. More than a third of Wisconsin’s population lives in the 11 counties forming its Lake Michigan Coast. 24% live in the southeast coastal counties of Milwaukee, Racine and Kenosha. The lakes provide not only a source of fresh water, but also climate moderation, transportation alternatives, recreational opportunities, property value enhancement, and a source of fish.

Milwaukee’s historical relationship to its water resources began with exploitation and development of this seemingly endless resource. Early Wisconsin settlers started water-intensive businesses including brewing, tanning, and food processing. Over time many other companies grew up to support these businesses with goods and services—meters, plumbing fixtures, valves, pumps, filters, controls, valves, heaters, coolers, tanks, dehumidifiers, leak detectors, software, etc. By the middle of the 20th century, the industry waste stream resulted in significant, regional water quality problems. A new generation of businesses filters, sensors, membranes, remediation technologies—grew up in response to a mandate from the Environmental Protection Agency (EPA) to clean up the lake and its tributaries, and to ensure a high quality supply of water to the industries that needed it. In more recent years the region has built on past experience and its wealth of knowledge and experience to develop a water-focused, asset-based marketing and business development approach that is based around the full water cycle: extraction, use, quality, and stewardship.

“Milwaukee exemplifies the hope that water may not only support growth, but catalyze it.”

– The Economist, May 20, 2010
Process

Building on the “cluster development” theory of Harvard economist Michael Porter, a broad coalition of public and private partners have worked together to develop the region into an international “water hub.”

Regional Partnership Fosters a Shared Vision. The Milwaukee 7 Regional Economic Development Advisory Council (M-7), launched in September 2005, was formed to create a cooperative economic development platform for the seven counties of southeastern Wisconsin: Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Waukesha and Washington. Its mission is to attract, retain and grow diverse businesses and talent. In its efforts to define regional strengths from which to build, the M-7 identified several possible themes, one of which was water. Around the same time, Rich Meeusen, the CEO of Badger Meter Company, and Paul Jones, CEO of A.O. Smith Company (the nation’s largest independent meter and hot water heater manufacturers, respectively), met to discuss areas of possible collaboration and saw potential to expand their efforts among the many water-related companies in the area.

The idea of a water hub as a regional economic development strategy and flagship effort for the M-7 was initially greeted with some skepticism. Student researchers at the University of Wisconsin at Milwaukee (UWM) identified over 150 locally based water-related businesses (out of 218 statewide)—including offices of five of the world’s 11 largest water technology companies, and the presence of dozens of water research specialists from engineering, science, legal, business, and other specialties—helping to advance the idea. Regular collaborative meetings among industry leaders, university researchers, and economic development advocates moved the process forward and eventually catalyzed the concept of a regional Water Council. A Water Summit in 2006 brought together various interested groups to discuss the region’s potential as a water hub for the first time, and the Water Council was formed to harness the resulting interest and the “amazing momentum” that resulted, according to Meeusen. A second summit in 2008 helped to further advance the program.

Evolution of the Water Council. Initially hosted by the Greater Milwaukee Committee and staffed with hundreds of executive volunteers, today the Council is an independent 501(c)(3) nonprofit organization with over 300 members, whose dues—along with foundation grants—pay for its operations. Members include individual consultants and entrepreneurs, small start-up companies, nonprofit environmental and educational organizations, governmental units, higher education institutions, and large corporations. It has an annual budget of $700,000, a staff of four and a 15-member board, co-chaired by the CEOs of Badger Meter and A.O. Smith and including representatives from the business, university, environmental, and public sectors. Full-time CEO Dean Amhaus was hired to run the Council’s operations in March of 2010.

The Milwaukee Water Council has three primary functions:

- Economic Development via message and marketing
- Talent Development through university-industry collaboration and student training
- Addressing the world’s water problems through technology.

A fourth area—public policy development—is also being considered.

The Water Council has come a long way in five years. Successful concept development, program initiation, and messaging about water as a unique regional asset led to several federal grants—from the U.S. Department of Labor’s WIRED program, U.S. Economic Development Administration (EDA), and National Science Foundation—and the designation of the greater Milwaukee area as the 14th United Nations Global Compact City. This international recognition and two major conferences in Milwaukee since 2006 have helped catalyze the development of partnerships and several research collaborations between industry, universities, and economic development interests.
The Water Council has actively and successfully advocated at the state level for the establishment and funding of a new Freshwater Institute at UWM, and has initiated collaborative relationships with Engineering and Law Schools at Marquette University and the UW – Whitewater’s Business School as well. State level support has also included $100,000 from the economic development office and the engagement of the Governor on trade missions for water company attraction.

There is also an important nonprofit component to the Water Council that helps to make the connection between Council work and broader environmental needs, and to bring in foundation interest and support. The International Alliance for Water Stewardship (AWS), based in Germany, has launched a North American Initiative in Milwaukee in a partnership between the Nature Conservancy and the Water Council. The AWS developed the first global water certification program for businesses, cities, and other major water users and managers, comparable to other voluntary certification systems that encourage sustainable forestry and energy efficient buildings. The Nature Conservancy and the Water Council have committed to secure $1.2 million in funding, with contributions pledged from companies including A. O. Smith Corp., Badger Meter, Bucyrus International, Diversy, MillerCoors, and Veolia Water North America. The state of Wisconsin has also agreed to support the effort in its initial year.

Creating Career Pathways. A final component of the university-industry collaboration is the talent pipeline, which builds on water resources training for science students from the UWM Freshwater Institute, law and engineering students from Marquette University, and business students from University of Wisconsin at Whitewater. The pipeline generates a locally grown, professional workforce with grounding in water issues to feed the needs of water-hub businesses. The Council places students in internships with member businesses—97 of them in 2011—which can lead to job offers or future career choices.
Lessons Learned

In retrospect, the opportunity for the Milwaukee region to build an economic asset out of its strengths in water industry and research capacity seems obvious, but its development required initial advocacy, strong leadership, persistent messaging, collaborative goal-setting and outreach.

Identify and Build on Existing Assets. The identification of a niche in water, building on regional strengths that previously were not perceived, gave the Milwaukee effort an edge. Until 2006 the existence of a predominance of water-based companies in SE Wisconsin had not been explicitly identified or understood as a strength—it was “hiding in plain sight.” Understanding its local asset allowed the region to focus economic development efforts on building and enhancing it, rather than trying to attract entirely new types or categories of industry. The Water Council was not constrained by a prescribed way to develop this unique niche, but was free to experiment and learn as it went. One example of this, according to Council CEO Dean Amhaus, was the Milwaukee region’s successful bid to become part of the United Nations Global Compact. While not immediately relevant to local economic development (and certainly not prescribed as typical practice), U.N. status conferred a level of visibility and international engagement that has proved extremely beneficial to the Water Council’s work.

Provide a Forum for Collaboration and Partnership. Prior to the formation of the Water Council, there was little or no collaboration between local water industries and university research facilities. Early university-industry mixers brought people together in an informal way to explore areas of common interest and possible collaboration. The creation of the Water Council as the coordinating institution to foster and facilitate hub activity between business, the public sector, universities, and water users has been a success—it is the only one of its kind in the country.

Amhaus also identified strong cooperative relationships among partner groups as a key to the effort’s success. “They get along well and collaborate on the broad, common vision,” he said. The synergy among Council partner groups is such that “we almost forget who we work for” in their combined efforts to advance common goals, i.e., business partners attend university symposia, and water quality issues are of great interest to companies as well as environmental groups and public health agencies. Because they don’t get too hung up on turf issues or who is in charge of what, they are able to foster the “catalytic collaboration” for which they have been recognized.

The 40-year-old Great Lakes Water Institute at the UWM became a communications and research partner for the nascent Council. Water Council partners identified a need for expanded local research capacity, eventually advocating successfully for the creation of UWM’s new Freshwater Institute, with new facilities and operations funded by the state. The initially casual university-industry mixers eventually led to the University-Corporate Linkages group (the “Technology Committee”) of the Council, which brings together Chief Technology Officers and university researchers in quarterly meetings to discuss and match company needs with research projects. In many cases businesses sponsor university research as a result. A $675,000 National Science Foundation Industry and University Cooperative Research Program grant was awarded to the Water Council in 2009 matching formal commitments from six area businesses to invest $1.5 million over a five-year period to support seven research projects per year with two universities (UWM and Marquette University). In May of 2010 the first seven research projects were announced, including work on chemical sensors, greywater assessment, hybrid nanomaterials, lead removal, and microbial fuel cell technology.

In August of 2010, UWM signed a memorandum of understanding with the EPA to collaborate on “innovative water technology development” both nationally and locally, adding another dimension to the water hub.

The Water Council also provides a forum to discuss and generate water quality and supply resources for other parts of the globe. The Council’s Water Stewardship Committee is made up of major water-
using companies (such as breweries and food processors), interested in efficient manufacturing processes and high water quality, to partner with regional companies that can advance or support their efforts. In one example, Miller Brewing Company has developed the technology to reduce its water consumption from a historical average of 10 cans and a current industry average of 6 cans of water per can of beer, down to 3 cans of water per can of beer. Several local microbrewers are following suit.

Communicate the Message. Developing a clear message and marketing the combination of social benefits and business opportunities has been important. The “cluster” strategy, with a strong communications component, has paid off. An early emphasis on messaging and PR created a “buzz” for the program and a rallying point for regional interests.

Find the Right Indicators of Success. The Council is intentionally not tracking their success in terms of job creation or company attraction statistics, though the M-7 does some of this. Rather, they are focused on the idea of growing capacity and momentum from the bottom-up—building on existing strengths to encourage new entrepreneurial capacity in the region—more of a home-grown emphasis than traditional economic development activity. Under this scenario, the region will develop such a strong set of water-related resources, and a water business-friendly environment, that it would attract compatible activities as a result.

In recent years, Milwaukee has emerged as an international water leader in both research/technology and business development, on par with other world water innovators such as Israel, Singapore and the Netherlands. The focus on helping to grow the 150+ water technology businesses already in the region and creating a collaborative university/industry relationship to foster new ideas, products and companies has sparked “a spirit and a drive not experienced here in almost a century,” according to CEO Amhaus. Results to date include the recruitment of three new companies to the region, expansion of existing companies and facilities, and the transfer of positions in one company from other cities to Milwaukee and in 2011, the Milwaukee Water Center received an inaugural U.S. Water Prize in recognition of the success of this collaborative effort.

Thanks to Dean Amhaus, The Water Council; Rich Meeusen, Co-Chair Water Council, CEO, Badger Meter Co.; and Dr. Sam White, Associate Dean, Director of Workforce Development, UWM Freshwater.

Case study written by Beth Conover, Econover LLC.

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CASE STUDY: TWIN CITIES, MINNESOTA

Minneapolis and St. Paul Collaborate for Regional Prosperity
Thinc.Green and the Mayor’s Initiative for Green Manufacturing

Background

Since 2006, Minneapolis and St. Paul have pursued a collaborative approach to sustainable economic development. This approach, which began as the Mayor’s Initiative on Green Manufacturing, has since developed into Thinc.Green, a strategic implementation program working to build demand for green products and services and generate momentum and support for continued innovation in green manufacturing and clean technology.

The impetus for this unprecedented collaboration on economic development came in April 2006 when the Ford Motor Company announced its intention to close a major auto manufacturing plant with several thousand employees in Saint Paul Mayor Chris Coleman then began work with the BlueGreen Alliance (BGA)—a Minneapolis-based national partnership of labor and environmental groups—to figure out how to retool the plant for a new industry. Together they realized that this potential job loss crisis could become the catalyst for a broad-based, regional effort to create new green jobs in Minneapolis-Saint Paul. Mayor R.T. Rybak in Minneapolis also saw the potential and, in November 2006, the two mayors and Dave Foster, the Executive Director of BGA, initiated a collaborative, strategic effort to pursue this vision.

Process

Building a Broad-Based Collaborative Effort. The first step to pursuing this joint economic development effort was to convene a group of stakeholders to help guide the process. The leadership of the two mayors proved pivotal to getting the other parties engaged. “Their strong commitment to work ‘across the river’ and position the whole region for growing green jobs sent out a strong signal about the seriousness of the Initiative,” said John Dybvig, BGA’s Director of Economic Development. “Both mayors were also willing to put in their own personal time on the phone to get community leaders engaged.”
The inclusion of the BlueGreen Alliance also proved to be essential to the initiative’s success. As a respected nonprofit organization and partnership between labor unions and environmental organizations, the Alliance helped assuage concerns that the regional process might become too political.

Each of the three partners had excellent relationships with a few key players on whom they could rely to broaden participation. Through their combined efforts, they were able to convene a group of more than 70 leaders representing green industry, labor unions, state and local legislators and agencies, and environmental and educational organizations. They formed subgroups: a development committee with industry representatives and high-level decision makers including the Mayors themselves; a steering committee to manage the day to day work; and subcommittees to delve into specific economic sectors. They also raised funds from partners and area foundations and hired a professional facilitator.

A Two-Phase Process. The Mayor’s Initiative was organized into two phases. In the first phase, the group focused on determining the kinds of manufacturers who could produce goods that would reduce greenhouse gas emissions. They sought to determine what could be done to help businesses operating in Minneapolis-Saint Paul develop and expand production of these goods, as well as what could be done to attract new green businesses to the area.

Before the group convened, the organizers picked three priority sectors based on their potential for addressing climate change: “Growth in renewable energy use, green building products (heating, ventilation and air conditioning (HVAC) systems, windows, doors, insulation, and other energy efficient building products) and green transportation options (reducing fossil fuel combustion) hold the greatest promise to reduce global warming.”

Three subcommittees—one for each of the priority sectors—identified 29 specific “product lines” within these growing green industries. Ultimately, the selected product lines stemmed from industries that were already strong in the area, and were expected to see increasing demand both locally and nationally.

Energy efficient windows, for example, were identified as a promising product line because the Minneapolis-Saint Paul area has several well-established national window manufacturers. Wind turbine parts were identified because state policies are expected to drive production of renewable energy across the state.

The Initiative recommended that the cities of Minneapolis and Saint Paul develop policies and incentives that would support growth across all product lines. In April 2008, the facilitator—CDC Associates—released Making It Green in Minneapolis-Saint Paul, a report summarizing the recommendations from Phase One. The recommendations were embraced by both cities; in Minneapolis, a Council resolution formalized the endorsement.

The second phase of the Initiative, lasting about six months, focused on more specific actions that the cities of Minneapolis and Saint Paul could take to grow these green sectors. “The recommendations from Phase One were fairly high level,” explains Cara Letofsky, Policy Aide to Mayor Rybak. “The next step was to home in on specific tools the cities should use to advance our economic development work.” Senior economic development staff from the cities and BGA took a
more active role in the process, overseeing the consulting team that had worked in the initial stage of the effort.

Thinc.Green\textsuperscript{MSP}. Staff from the cities and the Blue Green Alliance now say that the most significant accomplishment of Phase Two was the development of a marketing plan called “Manufacturing Better Business: Thinc.Green\textsuperscript{MSP} 2010-2012 Market Strategic Plan.” The Plan describes how the two cities can work together to build on their strengths as places to do green business, and to communicate those strengths to the outside world. “It goes beyond a standard marketing approach,” explained Emily Stern of the Minneapolis Department of Community Planning and Economic Development (CPED). “It takes the idea of regional branding, and ties it to a specific set of concrete policies and other strategic initiatives that will bring the two cities into alignment and establish the whole region as a place where green businesses can thrive.” This plan operationalizes the work of the Mayor’s Initiative and now guides the sustainable economic development work of the two cities.

The implementation of this plan is guided by a steering committee; with sub-committees assigned to oversee each of the specific initiatives. Stern describes the committee as “government light and industry heavy.” She explains that a common challenge is getting private sector input. In putting together the Thinc.Green\textsuperscript{MSP} committee they intentionally sought out private sector involvement. The result is a committee with at least 3/4 of its members representing industry and business. They also intentionally sought to balance representation of industry type and company size, ranging from startups to more mature companies. The committee also includes marketing firms, business association, and government entities.

Thinc.Green\textsuperscript{MSP} identifies five strategic initiatives, intended to build the local demand for green products, brand the Twin Cities region as a hub of green business, and support innovative policies that will create a green and business-friendly environment. The first two of these strategies have been identified as high priority by the Thinc.Green\textsuperscript{MSP} steering committee.

**Strategic Initiative I: “Buy Green”** Under this initiative Thinc.Green\textsuperscript{MSP} seeks to expand green-purchasing policies for local governments in the region to help grow the market for green products. Taken together, Minneapolis and St. Paul purchase millions of dollars in services and supplies each year. Their buying power has the potential to be a significant driver for local manufacturers offering green products. Minneapolis has environmentally preferred purchasing policy for services and products—from coffee, paper, and pencils to building materials. The policy encourages staff at all levels to consider green manufactures, products, and vendors (with cost as a consideration). St. Paul is in the process of developing and adopting a similar policy. A preference for local purchasing has run into a legal issue, as an interstate commerce clause restricts government entities from mandating local purchases. The city attorney is exploring it, and the cities are looking for other ways to include local purchasing preference.

**Strategic Initiative II: “Green Town.”** To build demand for green building materials and services, Thinc.Green\textsuperscript{MSP} supports the establishment of green building standards. Already both cities have adopted green building policies for municipal facilities, requiring at least a LEED Silver standard (Minneapolis does not require building to go through the certification process). St. Paul has also created a green building policy for private development projects that receive $200,000 or more in public financing or subsidy.
Lessons Learned

Making the Case for Collaboration. Through the Mayor’s Initiative and Thinc.GreenMSP, the Cities of Minneapolis and St. Paul have achieved an unprecedented level of collaboration. Historically, the cities were vigorous competitors in economic development: Many of the key groups around the table—the chambers of commerce, labor unions, and environmental groups—had never shared a room to work towards a common goal. The cities had previously competed for companies, seeing each potential business as an opportunity to expand their own tax base and provide jobs within their jurisdiction. However, in thinking about the global marketplace, the cities began to realize that they needed to work together if they were going to compete against other clean tech hubs.

Stern describes this realization: “We are only going to be competitive in the sphere of clean tech industry if we join forces, if we compete as a region, not only for manufacturers but for the entire supply chain. Everything from law firms to component part makers. Each city will benefit more by sharing resources and not competing for every business that comes in the door.”

She notes that Minneapolis has seen several companies move across borders, but is still able to see the benefits of keeping them in the Twin Cities Region. Ultimately, she says, “it’s about creating regional demand so that businesses from all over find this an attractive area to locate.”

Organizing an inclusive stakeholder process also created opportunities that would not have surfaced in a narrower process involving just one city’s economic development staff. “It’s interesting to observe all the ripple effects that emerged from Phase One,” said Stern. “When you are in the midst of it, a broad based dialogue that explores many disparate perspectives can make you feel like you aren’t moving towards decisions that are concrete and actionable. But in retrospect,
many of the things we are doing now can be tied back to relationships formed in that first phase, and recommendations that the group collectively made.”

The collaborative approach, for example, educated state legislators about the need for affordable capital among new green businesses. This was an important impetus for the legislators to introduce bills to create an ‘angel tax credit’ designed specifically to free up more capital for such businesses, and direct a state agency to issue grants using federal recovery funds to assist clean tech startups.

This same inclusive philosophy was applied in the formation of the Thinc.GreenMSP Steering Committee. By including a broad and diverse mix of private stakeholders, the cities have strengthened buy-in for the program and helped to ensure that the initiatives are responsive to the needs of businesses operating in the region.

Use Locally-Focused Research to Choose Priority Sectors. In Phase One of the Initiative, the group of stakeholders selected the three priority sectors based on their potential for reducing greenhouse gas emissions. The selection was made before research on local economic conditions had been conducted, and before area employers were invited to describe the trends they were seeing in their own businesses.

In Phase Two, they reviewed the list of priority sectors for gaps in light of the area’s unique economic capacities. The exercise led to the addition of three new sectors that already had strong and successful companies in Minneapolis-Saint Paul: waste reclamation, water treatment and management, and green chemistry. For other cities considering a planning process to build green manufacturing and jobs, it may make sense to delay the selection of priority sectors until there is time to conduct local industry research and dialogue with employers.

Allow Your Steering Committee to Steer. Upon convening the Thinc.GreenMSP Steering Committee, the first question posed was whether or not any additional strategies should be pursued beyond the original five. The committee identified the need to export opportunities for clean tech companies. Fortunately, this priority of the steering committee dovetailed nicely with work already underway between the Minnesota Trade Office and the Brookings Institution. In support of that effort, the steering committee formed a subcommittee on export expansion.

Institutionalize Regional Collaboration. Due to limited funding, it is not possible for Thinc.Green to have its own office or its own staff. Instead, the program is implemented through the economic development offices of the two cities. This arrangement is established through a Joint Powers Agreement between Minneapolis and Saint Paul. The agreement institutionalizes the commitment of both cities to align policies and resources in support of green business and will stay in place even as staff and elected officials change.

Thanks to Cara Letofsky, Policy Aide, Office of Minneapolis Mayor R.T. Rybak; Emily Stern, Senior Project Coordinator at Minneapolis Department of Community Planning and Economic Development; and John Dybvig, former Economic Development Director at Blue Green Alliance.

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Intergovernmental Cooperation in Michigan’s New Economy
A Long History of Service Sharing

About seven years ago, the Michigan Townships Association (MTA) joined with the Michigan Municipal League (MML) and Land Information Access Association (LIAA) to launch a new statewide program designed to foster and support intergovernmental cooperation for land use planning and community development. In some ways, the Partnerships for Change (PfC) Program was ahead of its time. Focused on reducing the costs often associated with inefficient, low-density urban development, the program has helped well over 150 municipalities find new ways to work together for community sustainability.

Today, there are new demands for the kind of intergovernmental cooperation demonstrated by the PfC Program. However, the emphasis has shifted. Given our troubled economy, planning and community development is focusing more on ways to reduce costs and increase government efficiencies. There is a growing emphasis throughout Michigan on working together for greater efficiencies, including shared and consolidated services as well as intergovernmental cooperation for economic development.

Introduction

With falling property values, most local governments across Michigan are experiencing a decline in revenues. State revenue sharing continues to be on the chopping block. At the same time, labor costs for most governments are increasing as health insurance rates and pension expenses go up. Service costs are also being pushed up by the price of energy and materials.

Local governments facing fiscal stress appear to have few options: either cut services or raise revenues (e.g., increased taxes and fees), or find some combination of the two. On the other hand, some people argue that local governments can save costs through greater efficiencies to avoid these difficult choices. Significant cost savings are possible, the argument goes, through the sharing of services, consolidation of government functions, or both. Governor Rick Snyder has offered this argument:
The discussion about service sharing has been going on for many years. Some people have argued that there are just too many local units of government in Michigan to deliver services efficiently. Therefore, consolidation should be considered. Other people have argued that the biggest problem is insufficient cooperation and coordination between local governments, both in planning for community development and in the delivery of services.

There appears to be little evidence that simply consolidating local units of government will make service delivery more efficient. As stated by Dr. Eric Scorsone (Senior Economist for Michigan’s Senate Fiscal Agency) in a 2010 white paper, “there is no clear relationship between spending per person and total number of local governments.” However, there is a long history of service sharing and consolidation agreements between some local units of government. For example, the Citizens Research Council was able to offer a long list of local government service-sharing examples in 2005, including fire and safety services, ambulance services, libraries, and water and sewer services.

On the other hand, it is clear that inter-jurisdictional cooperation and coordination has been both difficult and limited in many ways. While many townships, cities and villages are engaged in consolidated or shared service arrangements, the number of these arrangements is actually relatively small considering the number of general purpose governments in Michigan (well over 1,800) and the range of governmental services citizens expect. Further, these arrangements are usually limited in scope to one or two topics and seldom include comprehensive or community-wide planning.

In 2006, LIAA led a project in which all of Michigan’s townships, cities and villages were asked to complete a survey concerning inter-jurisdictional cooperation. More than 37% of the public officials from all parts of the state responded (over 660 surveys). Among other things, the survey responses indicated that:

- Over 36% of the townships, cities and villages do not cooperate with neighboring jurisdictions at all.
- Nearly 60% of local officials believe that many important barriers to inter-jurisdictional cooperation remain, including the time and expense of getting the process started and lack of information about how to get started.

**Barriers to Intergovernmental Cooperation**

Intergovernmental cooperation can be very difficult, even when it makes sense. In fact, most local officials will offer a long list of reasons why intergovernmental cooperation has been challenging. For the most part, these barriers are familiar interpersonal relationship concerns. Cooperation, after all, is a choice people make in relation to other people. Some of the most common barriers are listed below.

**Common Barriers to Intergovernmental Cooperation**

- Lack of Trust (e.g., distrust between potential participants)
- Fear of Failure and/or Political Loss
- Unequal Partners in Participating Municipalities (e.g., professional staff v. volunteers)
In addition to interpersonal and leadership barriers, there are a number of structural concerns involved in building inter-jurisdictional cooperation. For example, election cycles can disrupt longer-term efforts with political campaigns and remove experienced leaders from the process. Additionally, many cooperative efforts require a significant amount of up-front time, effort and funding to gather data and conduct analyses on the options. These up-front costs might be considered a form of risk capital, offering no guarantee of payback in the traditional sense.

Regardless of the barriers, the struggling economy and declining municipal revenues are forcing a reconsideration of inter-jurisdictional cooperation and coordination. Municipal officials are searching high and low for ways to save money and deliver services more efficiently. Some officials may begin by considering the familiar list of shared or consolidated services used by local governments all over Michigan. There are numerous organizational or legal mechanisms used to create such joint ventures, from inter-jurisdictional contracting to the creation of special purpose units of government (e.g., authorities).

**Common Shared or Consolidated Municipal Services**

- Fire Protection
- Public Safety (i.e., Police)
- Water and Sewer Services
- Libraries
- Parks and Recreation

In addition to this familiar list of municipal services, we should add governmental functions that help build local economies and organize a physical location into a place we want to call home. That is, local officials should consider community-wide cooperation in land use planning and regulation as well as economic development in a process often referred to as placemaking. These are critical municipal services that must be performed if we wish to protect and preserve cultural and natural resources, provide for public amenities (e.g., parks, sidewalks, streetscapes, trails), establish engaging community centers, and build both local and regional economies.

**Getting to Intergovernmental Cooperation**

Overcoming the barriers to intergovernmental cooperation may not be easy, but the beginning is simple. Citizens and officials open new channels of communication to explore common interests and community-oriented goals. There may be a catalyzing event such as the failure of a major employer in the area or conflict over a new development, but local officials and citizen activists must share the realization that “business as usual” will not work.

Whether the goal is to improve a key business and transportation corridor, provide for the development of a hiking and biking trail system, or manage the extension of water and sewer
Intergovernmental Cooperation and the New Economy

Managing Michigan’s economic challenges will require changes in our communities. Municipalities will continue to look for ways to reduce costs by purchasing, sharing or consolidating services with other local units of government. As described briefly above, there are hundreds of examples in Michigan of local governments doing joint purchasing, sharing fire and safety services, establishing water and sewer authorities, and many other combinations of purchasing power. However, the erosion of municipal revenues makes it clear that these efforts are no longer enough. We need to look beyond municipal borders and consider other factors.

Local governments are being asked to look at economic challenges differently, using a more holistic and multi-jurisdictional approach focused on community-wide and regional solutions. We need to be smarter and more efficient in service delivery, but we also need to build our local and regional economies with strategies that acknowledge the new global economy.
In January 2010, MTA published a white paper calling on local governments to work together to build strong regional economies.

Vibrant, healthy communities are essential to simultaneously attracting knowledge-based industries, highly educated workers and more diversified value-added resource-based economies in rural areas. (Reforming Michigan’s Local Government, MTA, January 2010)

Indeed, a wide range of experts across Michigan have called on our communities to embrace the New Economy and compete globally. They tell us we need to attract and retain educated, creative people by: creating amenity-rich, high quality places to live, work and recreate; encouraging an entrepreneurial spirit; building on the regional economic strengths; and providing high-speed communications infrastructure. These placemaking activities can help make communities more attractive and desirable to well-educated, young and creative people. Such settings are where entrepreneurs can find what they need to grow ideas and businesses. Places with these characteristics are the “great places” that will help turn the economy around.

Leaders Challenge the Status Quo and Accept Risks

Inter-jurisdictional cooperation can help to control the costs of government services by achieving better economies of scale in many different ways, or by simply avoiding unnecessary or duplicative expenses. However, these shared service arrangements require an up-front investment by the participants, including feasibility studies that address the economics as well as the organizational and political ramifications.

Once again, local government leaders need to be prepared to lead. Making changes to business as usual requires a focus on service and real humility. According to Doug Mansfield, supervisor for Union Township (Grand Traverse Co.), “You can’t be afraid of losing your seat. If you’re always afraid of losing an election, you’ll be unwilling to stick your neck out. Successful inter-jurisdictional cooperation should bring us greater efficiency, but it means making changes and change can seem risky, even if the math works out. So, you’ve got to keep focused on long-term benefits.”

Planning and Economic Development

Experts have long argued that planning and resource management should address areas larger than single townships, cities and villages. Numerous statewide studies and blue-ribbon panels over the past four decades have concluded that a lack of coordinated land use planning was responsible for the degradation of critical cultural and natural resources while generating excessive costs to communities through the construction and maintenance of inefficient or redundant infrastructure. By embracing intergovernmental cooperation in land use planning and community development, we can reverse this trend and focus attention on building or rebuilding great places for the New Economy in Michigan.

When groupings of adjacent municipalities recognize their common future and identify themselves collectively as a single community, they build economic strength and capacity while gaining better footing in the New Economy. Of course, there are varying degrees of cooperation and coordination.
Potential Community-wide Benefits

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<th>Levels &amp; Methods of Cooperation</th>
<th>Limit Effects of Rumors &amp; Conflicts</th>
<th>Limit Duplication of Efforts</th>
<th>Increase Purchasing Power</th>
<th>Limit Service Redundancies</th>
<th>Reduce/Control Infrastructure Costs</th>
<th>Strengthen Controls Over Unwanted Land Uses</th>
<th>Increase Defensibility of Land Use Controls</th>
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As suggested in the chart shown here, first steps toward cooperative planning and community development may be small, such as building formal communications and information sharing structures for the review of development proposals, marketing plans, and proposed infrastructure investments (e.g., capital improvement plans). With leadership and a greater commitment to the community, a combination of local governments can form a joint planning commission and adopt a joint master plan and a joint zoning ordinance. The local governments can also establish a single zoning board of appeals and share a single planning department to manage land use permits, infrastructure planning and economic development, resulting in several forms of cost savings.

Under this future-oriented scenario, the elected officials for each jurisdiction would retain the responsibility of adopting and changing ordinances and approving budget requests. In essence, each local government would retain veto power. But they would finally be in it together, planning and managing community-wide resources for the greater good. Further, they would be much stronger together. Their joint master plan and zoning ordinance would assure that particular developments were directed to the appropriate part of the greater community. Lawsuits that once claimed exclusionary zoning for such practices could be a thing of the past.

Leveraging New Community-Wide Cooperation

The Partnerships for Change (PfC) Program was launched in 2004 as a statewide program to stimulate and support greater intergovernmental cooperation for planning and community development. Developed by LIAA, MTA and MML with help from the Michigan Chapter of the American Planning Association and Michigan State University Extension, the program offers service grants to community groupings of townships, cities and villages that choose to cooperate for the preservation of cultural and natural resources and community development.

Over the past seven years, 30 different projects have been undertaken by Michigan communities with services provided by the PfC Program, demonstrating innovative approaches to intergovernmental cooperation for planning and community development. Some of these projects helped to lower institutional and interpersonal barriers to cooperation while others established regionally significant placemaking efforts. All of these projects have offered valuable lessons for local officials interested in intergovernmental cooperation.

The Fremont Community took the first steps toward a cooperative relationship in 1997. Community activists and local leaders from the City of Fremont, Dayton Township, and Sheridan Charter Township participated in Building a Sense of Place, a community asset-mapping and documentation project from LIAA. This cooperative venture led to a decision to pursue cooperative planning.
Working with LIAA under PfC, the jurisdictions formed the Fremont Community Joint Planning Commission (FCJPC), one of the first joint planning commissions in Michigan and the first to include a city. Fremont is often referenced as a model when other communities consider forming a joint planning commission. Carrying forward with LIAA and the PfC model, the three local governments developed and adopted the Fremont Community Joint Master Plan, the first of its kind in the state. The community is now engaged in the development of a joint zoning ordinance, which is near completion.

By having one planning commission administering a single plan and soon a single zoning ordinance, the Fremont Community is able to consolidate resources, saving some expenses and assuring more effective placemaking efforts. As stated by Jack Taylor of Sheridan Charter Township, “The Joint Planning Commission helps us avoid duplicating planning services. In addition to all the benefits of coordinated planning, the Joint Planning Commission helps the townships and the city be more efficient.”

In the Gratiot Community, the Gratiot Regional Excellence and Transformation (GREAT) plan brought together 23 local municipalities, the county, and Greater Gratiot Development Inc. to create one county-wide master plan that could be adopted and tailored by each jurisdiction. This is a rare document in the State of Michigan. Seldom, if ever, have this many jurisdictions come together to develop a shared master plan for individual adoption by each local unit of government.

Building on their collaborative foundation and the process of developing the GREAT plan, the local governments created and adopted a common zoning ordinance for wind turbines. This attracted the largest wind energy project in the state, representing a $400 million investment. Don Schurr, president of Greater Gratiot Development, explained that “The master planning process became the facilitation process for the wind energy ordinance.”

The Suttons Bay community stepped up to address its land use management concerns in groundbreaking fashion. Participating in the PfC Program, the Village of Suttons Bay and Suttons Bay Township received support to form a joint planning commission and develop a joint master plan.

By working together, the village and township of Suttons Bay developed a plan that met their mutual goals of preserving and enhancing the area’s thriving village center, first-class natural features, rich agricultural activity, and distinct sense of place. Furthermore, because the village and the township shared the investment of time and money in one plan instead of two, the Suttons Bay Community Joint Planning process was both innovative and extensive. It incorporated a “potential conservation area” assessment plan, an interactive geographic information system (GIS) process, public input options in gallery-walk style, and a youth photography component. The joint master plan is also being published as an interactive Web document.

Kathy Egan, planner for both the township and the village remarked, “The process brought together a greater pool of minds, which brought forth new approaches and ideas that the individual planning commissions had not considered. This led to a greater buy-in of the final product, which ultimately results in a stronger sense of ownership during the implementation phase of the plan.” Echoing Kathy’s statement, Tom Nixon of Suttons Bay Township stated, “All parties are enthusiastic and are excited about this document to be a living foundation for the next step of a zoning ordinance. We are very pleased.”
The Greater Lansing Community has been engaged in developing innovative approaches to intergovernmental cooperation since 2005. At that time, 17 municipalities of the Tri-County region (Clinton, Ingham and Eaton Counties) formed an Urban and Rural Service District/Urban Service Boundary (URSD/USB) committee. This committee was set up in response to the Tri-County Regional Planning Commission’s 2005 Regional Growth: Choices for our Future report (Regional Growth Project) to address concerns related to rising service and infrastructure costs.

While the URSD/USB committee had been discussing the potential of an Urban Service Boundary for some time, the current economic climate heightened the need to address escalating service and infrastructure costs. Furthermore, with the waning of immediate growth pressures, the group found that it was an opportune time to be proactive with a plan. With this in mind, the URSD/USB committee sought assistance through the PfC Program to investigate best practices and develop a course of action to implement the boundary. As Susan McGillicuddy, supervisor of Meridian Charter Township, explained, “The goal of the boundary is to get unmanaged growth under our control so we can reenergize our regional urban core and take unwanted development pressures off the townships. With the PfC support, we hope to have something in place by the end of the summer.”

Radical Cooperation for Entrepreneurial Communities

When adjacent townships, cities and villages finally recognize their interdependence as a single community, they move beyond intergovernmental competition for economic development and stop the cannibalizing of local markets — pitting one business area against another. Local government officials begin to act like true community leaders, acknowledging and encouraging diversity of all kinds. When local governments finally recognize that they share a single community, their leaders rise above the fear, distrust and history of past disputes to build new systems of communication and joint planning for coordinated economic development and resource management.

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Building A Partnership

The Western Adaptation Alliance (WAA) is a partnership between 11 municipalities aimed at enhancing tools, methods, and networking to build resilience to the unique climate impacts of the American West. Initiated by the cities of Flagstaff, AZ, Tucson AZ, and Salt Lake City, UT, the WAA now includes the cities of Aspen, CO; Boulder County, CO; Denver, CO; Fort Collins, CO; Las Vegas, NV; Park City, UT; Phoenix, AZ; and Santa Fe, NM. Combined, these municipalities represent over 25% of the regional population and serve as economic centers for more than 75% of the regional economy.

The concept for the WAA originated from a 2010 workshop entitled “Climate Leadership Academy on Adaptation Resilience,” hosted by the Institute for Sustainable Communities. At the workshop, municipalities from around the country came together to discuss concepts, best practices, and barriers to municipal efforts to build resilience towards climate change. However, the adaptation field at the time, and therefore most of the focus of the workshop was centered on preparing for sea level rise. Communities in the Front Range, Intermountain, and Southwest, recognized the need for information, resources, and support tailored to their needs, which included increased temperatures, precipitation changes, changes in extreme events, and alterations in water supply and quality.

The need for more support for the arid and semi-arid regions of the U.S. was taken to the annual meeting of the Urban Sustainability Directors Network (USDN), a leading network of municipal sustainability directors. Colleagues from the Front Range, Intermountain, and Southwest rallied behind a concept for a western city alliance focused on addressing the unique climate vulnerabilities of this region. Through the securing of a $75,000 Innovation Fund grant from the USDN, eight communities in the Front Range, Intermountain, and Desert Southwest were able to organize two full group meetings, commission a compilation of climate impact projections for the three sub-regions, and develop collaborative planning principles to guide future collaboration. Planning principles included:

- Recognize and utilize commonalities across the region;
- Collaborate regionally when appropriate;
- Embrace and understand regional differences;
- Respect each other and leverage shared knowledge and collective skills;
- Plan locally, consistently applying shared regional understandings;
- Utilize a multidisciplinary, integrated approach to solutions;
- Plan for multiple time frames and impact scenarios;
- Select strategies with multiple benefits and minimal detrimental impacts;
- Apply a “degrees of risk” framework.
Since its inception, the WAA has expanded to include three additional members: Aspen, CO; Phoenix, AZ; and Santa Fe, NM. In March of 2012, the members of the WAA brought together multiple staff from their respective communities to convene a Climate Leadership Academy focused on building climate resilience in the Intermountain West. The event, hosted by the Institute for Sustainable Communities, provided an opportunity to share best practices, delve deeper into lessons learned, and build mutually reinforcing support systems. By bringing together teams of four to five from each community, the members of the WAA were able to build broader and stronger inter and intra-municipal support for climate adaptation efforts.

Founders of the WAA faced numerous challenges. Most notably, each of the member communities had their own definition of adaptation, different political structures, different needs, and were at different places in their adaptation process. While not completely alleviated, these challenges have begun to be addressed through the creation of a regional vision for adaptation, the development of regional and sub-regional (3) projections of climate change scenarios that each municipality can use to undertake their resilience efforts, and a commitment to continued collaboration. The WAA, at its core, is a learning network that acknowledges that different processes and realities may need to be undertaken by each of its unique members. The goal of the WAA is not to create a regional adaptation plan, but to allow municipalities facing similar climate impacts to collaborate, learn from one another, and share their experiences.

Members of the WAA participate in monthly calls, which include member updates and learning opportunities. As next steps, the WAA is seeking funding to supplement monthly calls with biannual group meetings as well as funding to implement adaptation actions in each of the member communities.
COLLABORATION ACROSS BOARDERS: ADDITIONAL RESOURCES

LINKS

LEADERSHIP TOOL KIT:
Science Resources

This list includes resources on climate change science that is national and/or regional in focus.

Adapting to Climate Change in Ontario, Report of the Expert Panel on Climate Change Adaptation
This report articulates the challenges that climate change poses to communities in Ontario and lays out recommendations and strategies for decision makers facing these challenges.

American Association of State Climatologists
Provides information on and access details for each state’s appointed State Climatologist.
[http://www.stateclimate.org]

Climate Change 2007: Impacts, Adaptation, and Vulnerability

Climate Change Indicators in the United States
This report gives an overview of climate impacts and 24 climate change indicators for the United States. The report uses visual tools to help readers interpret these indicators.
[http://www.epa.gov/climatechange/pdfs/climateindicators-full.pdf]

Climate Wizard
This web-based mapping program allows non-technical as well as technical users to view historic and projected future temperature and rainfall maps around the world (with finer-scale data for the United States).
[http://www.climatewizard.org]

Confronting Climate Change: Science, Impacts, and Solutions
This webpage provides access to several reports in a series of in-depth reports on the potential consequences of climate change in several regions and states: the Midwest (IN, MN, MO, OH), Northeast (CT, MA, ME, NH, NJ, NY, PA, RI, VT), Great Lakes region, and the Gulf Coast. To find the relevant publication, search the page for the name of the state or region.
[http://www.ucsusa.org/publications]

Global Climate Change Impacts in the United States
This report summarizes, in plain language, the science and the impacts of climate change on the United States by region, now and in the future. It provides an overview of impacts on various aspects of society and the economy such as energy, water, agriculture, and health.
Regional Integrated Sciences and Assessments (RISA)
This webpage provides access to all of the currently funded Regional Integrated Sciences and Assessments (RISA) program teams for three Western and four Southern regions. The regional teams support research that address complex climate sensitive issues of concern to decision makers and policy planners. Research areas include fisheries, water, wildfire, agriculture, public health, and coastal restoration.

National Program Website: http://www.climate.noaa.gov/cpo_pa/risa
GLISA (Great Lakes Integrated Sciences and Assessment) http://glisa.umich.edu/

Assessing Risk and Vulnerability

This list includes resources on risk assessment, including examples, guidelines, and tools. Note that these resources use different terminology for aspects of a risk assessment, and that they may cover different portions of the process.

Adapting to Climate Change: A Risk-based Guide for Local Governments
This guide argues for a risk-based approach to adaptation planning and outlines the process for risk management. It also highlights climate trends and projections in Canada and has an appendix that discusses risk communications and perceptions and how to talk to the public about risks.

Best Practices Approaches for Characterizing, Communicating, and Incorporating Scientific Uncertainty in Climate Decision Making
This report is a tutorial for climate analysis and decision-making communities on current best practice in describing and analyzing uncertainty in climate-related problems.

Business Areas Climate Impacts Assessment Tool (BACLIAT)
This tool provides a good starting point for exploring the implications of climate change for a particular business or sector and for municipalities who would like to engage the business sector in climate adaptation efforts. It is comprised of a simple checklist for assessing the potential impacts of climate change under generic business areas. It encourages the consideration of both threats and opportunities and is most effective when used as part of a group brainstorming exercise.
http://www.ukcip.org.uk/bacliat/

Climate Adaptation: Risk, uncertainty and decision-making
This report provides an 8-stage decision-making framework for examining and choosing among available adaptation options. This framework is most appropriate for decision makers who have some knowledge of climate risks, but who want to better understand them and their adaptation options.

Climate, Fire, and Carbon Cycle Science
This website provides an overview of research science conducted by the Climate, Fire, and Carbon Cycle Science Research Work Unit of the U.S. Forest Service's Northern Research Station. Their mission is to develop and provide the basic science, quantitative methods, and technology needed to make decisions about forest ecosystems and the atmosphere related to climate change, fire, and carbon.
http://nrs.fs.fed.us/units/climate/focus/climate_change/
Community-Based Risk Screening Tool—Adaptation & Livelihoods (CRiSTAL)
CRiSTAL is a project planning and management tool. Used at the community level to incorporate local knowledge about climate change and resource use considerations into development projects, it helps project planners and managers integrate risk reduction and climate change adaptation into projects. CRiSTAL uses a series of worksheets to guide users systematically through the climate change context of their project, the resources at risk, existing coping strategies, and possible project modifications to reduce project vulnerability to climate change. It is designed as an Excel Workbook, but can be used in hard copy. The Workbook and Users’ Manual are available in French, English, and Spanish.
☞ http://www.cristaltool.org/content/about.aspx

Community Resilience: A social justice perspective
This report provides a good, brief overview of the key social factors that make a community vulnerable and ways to bolster resilience.

Corporate Risk Case Study: City of Chicago Climate Change Task Force
This document reports the results of a Corporate Risk case study modeled for City of Chicago’s municipally-controlled assets. Although it does not provide information on the proprietary methodology used, it does show output that can be obtained by such an analysis, which may be useful to others considering whether to undertake such an analysis.

Engineering Literature Review: Water resources – infrastructure impacts, vulnerabilities and design considerations for future climate change
This review includes information on water infrastructure and climate change resource documents, impacts of climate change on water resources, and a summary, discussion and recommendations. Developed for a more adaptation-focused Canadian audience, this review can be a useful starting point for U.S. water managers seeking to assess their risks.
☞ http://www.pievc.ca/e/Appendix_C_Literature_Reviews.pdf

HAZUS - FEMA's Methodology for Estimating Potential Losses from Disasters
HAZUS is risk assessment software for analyzing potential losses from floods, hurricane winds and other disasters. In HAZUS, current scientific and engineering knowledge is coupled with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before, or after, a disaster occurs. Potential loss estimates analyzed in HAZUS-MH include: physical damage to residential and commercial buildings, schools, critical facilities, and infrastructure; economic loss, including lost jobs, business interruptions, repair and reconstruction costs; and social impacts, including estimates of shelter requirements, displaced households, and population exposed to scenario floods, earthquakes and hurricanes. HAZUS is available in DVD format for free.
☞ http://www.fema.gov/protecting-our-communities/hazus

Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Summary for Policymakers
This summary for policymakers presents key findings from the Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). The SREX approaches the topic by assessing the scientific literature on issues that range from the relationship between climate change and extreme weather and climate events (‘climate extremes’) to the implications of these events for society and sustainable development. The assessment concerns the interaction of climatic, environmental, and human factors that can lead to impacts and disasters, options for managing the risks posed by impacts and disasters, and the important role that non-climatic factors play in determining impacts.
NOAA Coastal Hazard Assessment Tool
The Hazard Assessment Tool is an easy-to-use Internet mapping application that helps users identify the potential hazards that affect a location. It uses geospatial hazards data and supporting base data to identify hazards, and helps with planning and permitting. Once a location has been selected, the tool queries the hazards data to determine the hazards zone(s) for the location and provides supporting information to put the hazards information in proper context.
http://www.csc.noaa.gov/hat

Shaping Climate-Resilient Development: A framework for decision-making
This comprehensive report provides concepts and tools for thinking about adaptation in terms of risk and how to assess that risk: risk to life, to communities, and to economies and livelihoods. It provides guidance on quantifying the risks of climate disruption, how to make an economic case for investing in resiliency, and how to prioritize adaptation projects. It draws on a number of case studies around the world.

Transportation and Climate Change Clearinghouse—Climate Change Impacts
This annotated list of resources on the impacts of climate change on transportation infrastructure is continually updated.
http://climate.dot.gov/impacts-adaptations/forcasts.html

Urban Flood Risk Management: A tool for integrated flood management
This tool guides practitioners on flood management and includes information on various types of urban flood hazards, impacts of flooding in cities, risk assessment and management, and a framework for flood risk management. The tool also discusses integrating flood risks in urban planning, surface water management plans, and participatory planning.

Vulnerability Assessment for Climate Adaptation
This technical paper presents a structured approach to climate change vulnerability assessment. The paper recommends five tasks and suggests appropriate methods suitable for different levels of analysis. The five tasks link a conceptual framing of vulnerability to identification of vulnerable conditions, analytical tools and stakeholders.
http://www.aiaccproject.org/meetings/Trieste_02/trieste_cd/Vulnerability/TP3_Downing.doc

Adaptation Planning
This list includes climate change adaptation planning examples, more case studies, guidelines and tools.

Changing Climate, Changing Communities:
Guide and Workbook for Municipal Climate Adaptation
This guide is a compendium of resources that provide a milestone based framework to assist local governments in the creation of adaptation plans to address the relevant climate change impacts associated with their communities. This guide includes workbooks
Cities Preparing for Climate Change: A study of six urban regions
This report incorporates the lessons learned from six “early adopters”—London, New York, Boston region, Halifax, Greater Vancouver, and Seattle and King County—and addresses these experiences by phase of the adaptation planning process.
http://www.cleanairpartnership.org/pdf/cities_climate_change.pdf

Climate Adaptation Starter Kit
The toolkit includes EcoAdapt’s top resources, tools and adaptation examples. It includes resources for assessing climate change vulnerability, risk and impact; processes to guide the development of adaptation strategies; a sampling of climate adaptation portals, tools and resources; adaptation case studies; a guide to getting started on adaptation planning and tips for evaluation and monitoring of adaptation programs.
http://ecoadapt.org/programs/awareness-to-action/climate-starter-kit

Federation of Canadian Municipalities Climate Adaptation Resources
Provides details, guidance, and tools to help municipalities begin an adaptation process.
http://www.fcm.ca/home/issues/environment/climate-change-adaptation.htm

Identifying Adaptation Options
This guide includes a framework for identifying and selecting adaptation options.
http://www.ukcip.org.uk/wordpress/wp-content/PDFs/ID_Adapt_options.pdf

Local Government Climate Change Adaptation Toolkit
This toolkit includes a 68-page comprehensive manual providing a conceptual framework for adaptation and step-by-step instructions for 14 tools geared towards different stages of adaptation planning. The tools are also available for download from this page, including a planning workshop template, stakeholder identification worksheet, barriers document, and risk assessment scenario worksheet. The tools were piloted with 5 Australian communities prior to the toolkit’s release in 2008.

The Mitigation-Adaptation Connection: Milestones, Synergies and Contradictions
This primer briefly describes an approach for integrating adaptation into mitigation planning, and provides several examples, by sector, of how mitigation and adaptation actions can be synergistic, and how they may be contradictory.

Objective Setting for Climate Change Adaptation Policy
This guide presents an iterative process for setting objectives in climate change adaptation planning and implementation. It also describes how the model was applied by Defra (UK’s Department for Environment, Food, and Rural Affairs) to generate ‘strawmen’ objectives and targets. This methodology can help other regions systematically think through and prioritize their own objectives.
http://www.ukcip.org.uk/wordpress/wp-content/PDFs/Objective_setting.pdf

Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)
Tools and Frameworks
This webpage provides a list of available tools and frameworks for integrating climate change adaptation into plans and programs at the municipal, community, regional, and First Nations level.
http://www.climateontario.ca/tools.php
Planning for Climate Change: Customizable Workshop Materials
The customizable workshop was developed for planners and coastal decision makers. Piloted in two locations in 2009 in Washington State, the materials, including all PowerPoints and streaming videos, are available on the website, and can be used as a roadmap for engaging planners and decision makers. The materials are grounded in science and focus on actions to prepare for and adapt to impacts of climate change.

Preparing for Climate Change: A Guidebook for Local, Regional and State Governments
This guidebook describes a step-by-step process for achieving a set of climate change preparedness milestones within the context of municipal planning, based on ICLEI’s five milestone process. For more information see the Resource Snapshot earlier in this Resource Guide on page 18.
☞ http://cses.washington.edu/cig/fpt/guidebook.shtml

State and Local Adaptation Plans
This webpage tracks state and local efforts on adaptation planning, and provides links and brief overviews. Localities include Homer AK, Phoenix AZ, several cities in CA, Miami-Dade County FL, Alexandria VA, King County WA, and Milwaukee WI.
☞ http://www.georgetownclimate.org/adaptation/adaptation-plans.php

Terrestrial Ecosystem Adaptation
This report explores how ecosystems might adapt to climate changes over the next half-century, predicts that large parts of the United States will confront a range of weather-related problems—from insect infestations to wildfires, from melting permafrost to dried wetlands, and from incursions of invasive species to large-scale species extinction. Although its primary focus is on ecosystems, it also provides a map-based overview of heat, precipitation, and snow melt trends across the United States.

UKCIP Adaptation Wizard
This web-based tool guides users through a 5-step adaptation planning process and provides relevant resources for each step, including how to identify vulnerabilities to climate change and how to identify ways to reduce vulnerability. It is designed for use by a wide range of audiences new to climate change adaption, and it provides a structure for planning and awareness-raising.
☞ http://www.ukcip.org.uk/wizard/

Adaptation Strategy Identification
This list includes catalogs of climate change adaptation strategies: comprehensive resources, and strategies by type: public health, heat, infrastructure, stormwater management, natural systems

GENERAL RESOURCES

Adapting to Climate Change: A Planning Guide for State Coastal Managers– A Great Lakes Supplement
This guide provides an overview of anticipated climate impacts and adaptation initiatives for planners in the Great Lakes Region.
☞ http://coastalmanagement.noaa.gov/climate/adaptation.html
Climate Change Actions for Local Governments
This straightforward guide provides a large sampling of possible adaptation actions related to infrastructure, health services, natural resource management, water and sewerage services, and other areas. Descriptions, case studies, and examples are integrated together for easy reading. The guide was developed for Australia but it offers a useful starting point for U.S. cities.

Compilation of 50 Programs for Use in Community Based Adaptation Projects
This compilation presents model programs for addressing challenges in community based adaptation and participatory forest restoration projects. Programs represent the best programs being used successfully in the field today, in categories of water use management, forest restoration, livelihoods, agriculture and building community resilience.

Hazard Mitigation Best Practices Search
This database of best practice in disaster mitigation is searchable by location, sector type, hazard, type of activity, and keywords. Hazards include drought, severe storm, extreme temperatures, winter storm, and wildfire. Activities include building codes, outreach, floodplain management, land use/planning, community shelters, utility protective measures, vegetation management, and wetland restoration.
☞ http://www.fema.gov/mitigationbp

DEVELOPMENT AND INFRASTRUCTURE

Adapting to Climate Change: A checklist for development
This checklist provides guidance on designing building developments to withstand a changing climate throughout their lifetime. The checklist covers issues such as water re-use and efficiency, reducing flood risk, avoiding overheating and minimizing damage from subsidence and heave.
☞ http://www.london.gov.uk/lccp/publications/docs/adapting_to_climate_change.pdf

Adapting to Climate Change: A case study companion to the checklist for development
The companion guide applies the Checklist for Development’s guidance (above) and provides case studies of developments or buildings that incorporate adaptation in their design and construction. This guide provides replicable cases of buildings and developments that incorporated adaptation measures to increase resiliency to the changing climate. The case studies address climate change impacts, such as urban heat island effect and flooding, and they illustrate techniques relevant to key climate change adaptations issues, such as siting, site layout, ventilation, drainage, water, outdoor spaces and connectivity.

ClimateSMART—Climate Change: Developer’s Risk Management Guide
This can serve as a model government guide for developers. It was created for developers of Halifax’s coastal, low-lying, urban/forest fringe, and rural areas. The guide includes an overview of climate change, describes the predicted impacts on Halifax relevant to development projects, provides a step-by-step approach to assessing the risk, and provides a checklist that can be used in the planning and evaluating of development proposals.
International Conference: Strategies for Adapting Public and Private Infrastructure to Climate Change
This website presents a list of workshop materials for the international conference, “Strategies for Adapting Public and Private Infrastructure to Climate Change,” held in El Salvador, June 30-July 1, 2010. Resources useful to a U.S. audience include the workshop agenda, concept note, conference presentations, and publications related to the topic of climate proofing of infrastructure in the context of climate change adaptation and urban and regional planning.
http://www.adaptationlearning.net/infrastructure-adaptation

PUBLIC HEALTH AND HEAT

Adapting to Urban Heat: A Tool Kit for Local Governments
This analytic tool helps policy makers to consider a combination of four built-environment changes (cool roofs, green roofs, cool pavements, and urban forestry) and provides clear criteria for selecting among them, along with examining the roles government can play in pursuing these changes: shaping government’s own operations, mandating or providing incentives for private choices, and engaging in public education.

CDC Policy on Climate Change and Public Health
This statement summarizes some of the main public health risks and populations at risk for specific climate impacts. It also identifies eleven priority health responses, most of which point toward actions to be taken in the future.
http://www.cdc.gov/climateandhealth/policy.htm

Environmental Health Primer
This primer provides a basic understanding of environmental public health concepts and principles to help local officials make better decisions. Geared to local boards of health but provides useful background information for other official audiences too. Chapters of relevance to climate adaptation include air quality (in Part 2), drinking water and wastewater (Part 3), and vector control (in Part 4).

Excessive Heat Events Guidebook
This guidebook provides information that local public health officials and others need to begin assessing their vulnerability to excessive heat events and developing and implementing notification and response programs. Cost-benefit guidelines are also included.

Heat Island Effect
This website provides access to EPA’s Urban Heat Island Community Actions Database, by state & locality, initiative type, and strategy. Initiative types include ordinances, building codes, and outreach programs; strategies include trees and vegetation, green roofs, cool roofs, and cool pavements. It also has resources such as outreach materials, a compendium of strategies, and a Mitigation Impact Screening Tool.
http://www.epa.gov/heatislands/index.htm

Mitigating New York City’s Heat Island with Urban Forestry, Living Roofs, and Light Surfaces
This report includes a step-by-step cost-benefit analysis of the titular approaches to mitigating the urban heat island effect.
http://www.nyserda.ny.gov/Publications/Research-and-Development/Environmental/EMEP-Publications/~/media/Files/Publications/Research/Environmental/EMEP/06-06%20Complete%20report-web.ashx
Ready for Change: Preparing Public Health Agencies for the Impacts of Climate Change
This manual provides practical guidance to public health departments prioritizing and implementing operational changes that allow public agencies to prepare their employees and communities for climate change. Actions discussed include those that can be implemented immediately and at low cost, to those requiring long-term planning and funding. Additionally, it provides guidance for demonstrating and communicating a commitment to reducing risks and building resilience. Topics discussed are extreme heat, disease patterns, water, food, air quality, and mental health. Developed for Oregon but transferable elsewhere.
http://www.theresourceinnovationgroup.org/storage/PubHealthPrepManual5-10LR.pdf

NATURAL AREAS

A Practitioner’s Guide to Climate Change Adaptation in Ontario’s Ecosystems
This report introduces the concepts of climate change adaptation, vulnerability, and risk. It also describes vulnerability and risk assessment tools and techniques, and a framework that can be used to support adaptive management in a rapidly changing climate.

Landscape Conservation Cooperatives
Landscape Conservation Cooperatives (LCCs) recognize that these challenges transcend political and jurisdictional boundaries and require a more networked approach to conservation—holistic, collaborative, adaptive and grounded in science to ensure the sustainability of America’s land, water, wildlife and cultural resources. As a collaborative, LCCs seek to identify best practices, connect efforts, identify gaps, and avoid duplication through improved conservation planning and design. Partner agencies and organizations coordinate with each other while working within their existing authorities and jurisdictions. The 22 LCCs collectively form a national network of land, water, wildlife, and cultural resource managers, scientists, and interested public and private organizations—within the U.S. and across our international borders—that share a common need for scientific information and interest in conservation.
http://www.doi.gov/lcc/index.cfm

LAKE LEVEL CHANGE

Coastal Communities and Climate Change: Maintaining future insurability
This report looks at the impact of climate change on flood risk at a number of coastal locations around the world, considering sea level rise, the effect of wind speed on storm surges, and changes in land use. Although the four case studies mentioned in the report are from outside the United States, the lessons learned are applicable to any coastal community. That the publisher is a large insurance company may aid planners in making the case for adaptation action.

Synthesis of Adaptation Options for Coastal Regions
This guide provides a brief introduction to key physical impacts of climate change on estuaries and a review of on-the-ground adaptation options available to coastal managers to reduce their systems’ vulnerability to climate change impacts. Estuaries are highly and uniquely vulnerable to climate change.
http://water.epa.gov/type/ocem/cre/upload/CRE_Synthesis_1-09
STORMS/FLOODING

Cities and Flooding:
This text provides guidance on managing the risk of floods in an urban environment and serves as a primer for decision and policy makers across sectors.

How to Become StormReady®
This website provides guidelines and a toolkit to emergency managers to help them prepare their communities for severe storms, and explains how to apply to become a StormReady community. As of August 2010, there were 1,637 StormReady sites, including cities, counties, and commercial properties.
http://www.stormready.noaa.gov/howto.htm

Stemming the Tide: How local governments can manage rising flood risks
This study analyzes how Virginian local governments can use existing land use powers to adapt to climate change impacts such as, flooding and coastal erosion, increased pressures on emergency response and rising infrastructure and property damages. The study also looks at legal obstacles and specific land use tools for local governments implementing policy identified in Virginia’s Climate Action Plan.
http://www.georgetownclimate.org/sites/default/files/Va-Case-Study(1).pdf

Urban Flooding
This document gives an overview of UK approaches to managing urban flooding, including dealing with an overwhelmed sewer system, and examines ways to improve policy.

WATER SUPPLY

Emerging Climate Change Impacts on Freshwater Resources:
A perspective of transformed watersheds
This report discusses the effect of climate change on freshwater resources in the United States. Six case studies illustrate regional, cost-effective adaptation efforts for climate change affecting freshwater sources: Colorado River, Boston Metro, New York City, Flint River, Everglades, and San Joaquin River. Starting on page 24 the report also lists adaptive responses to climatic effects.

U.S. Drought Portal (NIDIS)
The U.S. Drought Portal is part of the interactive system designed to: provide early warning about emerging and anticipated droughts; assimilate and control the quality of data about droughts and models; provide information about risk and impact of droughts to different agencies and stakeholders; provide information about past droughts for comparison and to understand current conditions; explain how to plan for and manage the impacts of droughts; and provide a forum for different stakeholders to discuss drought-related issues. Drought information can be viewed by state or region.
http://www.drought.gov/portal/server.pt/community/what_is_nidis/206
Implementation and Funding

Clean Water Financing: Water Quality Cooperative Agreements
This page links to a number of water impact-relevant funding programs, including the Clean Water State Revolving Loan Fund (e.g. for estuary protection projects), Water Quality Cooperative Agreements, and Drinking Water State Revolving Loan Funds.
☞ http://water.epa.gov/grants_funding/cwf/waterquality.cfm

Guidance for Municipal Stormwater Funding
This paper discusses the evolution of local government’s role in municipal stormwater management and serves as a resource to local practitioners as they address stormwater program financing challenges. The guide covers various sources of funding, legal considerations, implementation of stormwater funding programs and case studies from U.S. cities.

Implementing Climate Change Adaptation: Lessons Learned From Ten Examples
This report provides practical examples of adaptation planning and implementation from cities and counties across the U.S., including Boulder (CO), Chicago (IL), Chula Vista (CA), Eugene (OR), Keene (NH), Miami-Dade County (FL), New York City (NY), Olympia (WA), Portland (OR) and Taos (NM) and reports on lessons learned.

Stakeholder Engagement

This list includes resources for communicating effectively about climate change adaptation. Included are examples of climate change adaptation communication, communication aides, persuasion strategies, and community engagement guides.

Climate Communications and Behavior Change
This guide illustrates the challenges with existing climate change communications efforts and provides tips on how to frame and deliver outreach efforts in a way that motivates changes in thinking and behavior for a range of audience segments. The focus is not on climate adaptation, though the guide does include some tips explicit to it.
☞ http://www.theresourceinnovationgroup.org/storage/PubHealthPrepManual5-10LR.pdf

Communicating Climate Change: Podcasts with Social Scientists
This website features extended audio interviews with leading social scientists about the human dimensions of climate change. The podcast is aimed at professional science communicators, whose job it is to explain complex scientific concepts and the work of scientists to the public at large.
☞ http://blogs.oregonstate.edu/communicatingclimatechange

Community and Regional Resilience:
Perspectives from hazards, disasters, and emergency management
This research paper outlines: what makes people and places vulnerable, including location, infrastructure and economic factors; what makes communities resilient, including recognizing and understanding hazards and planning for disaster recovery, planning and land use and development; and barriers to planning for resilience. It also reviews possible measurement and indicators for resilience and some frameworks for community resilience assessment.
Engaging Chicago’s Diverse Communities in the Chicago Climate Action Plan
This website provides links to the Field Museum’s Division of Environment, Culture and Conservation’s (ECCo) reports on community engagement in Chicago regarding implementation of the Chicago Climate Action Plan. The reports describe an inclusive approach for soliciting public perceptions of climate change issues.
☞http://fieldmuseum.org/explore/department/ecco/engaging-chicago-communities-climate-action

Expand Your View: Insights for public communicators from behavioral research
This primer provides a research-based look at how to improve communication effectiveness. Topics include understanding and addressing psychological barriers, embracing voluntary learning, and fostering social change. Not specific to climate change but useful to such public officials.
☞http://seagrant.oregonstate.edu/sgpubs/onlinepubs/h08006.pdf

Having The Climate Conversation Strategies For Local Governments
This resource is meant to help local governments with the various aspects of communicating climate change, focusing on the WHY, WHO, WHAT, WHEN, and HOW municipal practitioners can best inform and educate stakeholders within the community. It includes tools, frameworks, and case studies for developing a climate change communication strategy.
☞http://www.icleicanada.org/images/icleicanada/pdfs/Having_the_Climate_Conversation.pdf

Hold That Thought!
Questioning five common assumptions about communicating with the public
This report discusses false assumptions about communicating with the public, and provides some guidance about designing more effective communications. The false assumptions are: We need to get the word out; We already know how to communicate; If they only had information Z then, recipients of our information will consider it thoughtfully; and, Successful communication is an art.
☞http://seagrant.oregonstate.edu/sgpubs/onlinepubs/h08005.pdf

Introduction to Stakeholder Participation
For those brand new to stakeholder participation, this document briefly examines several important aspects of stakeholder participation, provides guidance on identifying coastal management stakeholders, describes some of the most commonly used techniques, and discusses evaluation of stakeholder participation.

Learned Lessons on Key Considerations for Communicating Climate Risk
This webpage summarizes key considerations for communicating climate risk, based on lessons learned from developing climate risk communication strategies and implementing them on the ground in Africa and Asia, but applicable elsewhere. (Based on a synthesis report of the Advancing Capacity to Support Climate Change Adaptation project, which can be downloaded at http://start.org/download/accca-synthesis.pdf.) Strategies described are: two-way dialogue; knowing the local context; understanding the local know-how on climate risk; engagement in the process; combining strategies to target different stakeholders; strategic use of space; and innovative ways of communicating.
☞http://wikiadapt.org/index.php?title=Learned_lessons_on_key considerations_for_communicating_climate_risk
Participatory Learning and Action: Community-based adaptation to climate change
Through reflections, case studies and descriptions of available participatory tools, the authors give an overview of working in communities on adaptation efforts. The first section includes reflections on participatory processes and practice in community-based adaptation to climate change. These have a variety of entry points, including participatory vulnerability analysis and disaster risk reduction frameworks. The second section focuses on participatory tool-based case studies and describes a participatory process with an emphasis on the use of a particular tool. The third section, participatory tools, includes shorter, step-by-step descriptions of how to facilitate a particular tool in a community.
☞ http://pubs.iied.org/pdfs/14573IIED.pdf

Preparing for Climate Change in the Great Lakes Region
This report summarizes the observations and findings from a one-day workshop of forty representatives from Great Lakes foundations, non-governmental organizations, agencies, and universities. The workshop’s objectives were to identify policy changes that will enable Great Lakes communities to adapt to climate change and protect major ecosystems, and to identify strategies for implementing those policy changes.

Setting the Record Straight: Responses to common challenges to climate science
This brief document provides credible responses to some common ‘skeptic’ arguments against climate change. For more detailed, in-depth treatment, see Grist’s guide, “How to Talk to a Climate Skeptic” http://www.grist.org/article/series/skeptics.
☞ http://www.theresourceinnovationgroup.org/storage/Setting_record_Straight.pdf

Stakeholder Engagement Strategies for Participatory Mapping
The participatory mapping tool is designed to help engage the public in land use decisions. The maps represent society’s values, including social, cultural and economic values. The publication provides facilitators with strategies to lead a participatory mapping process. This process is particularly useful in creating opportunities for stakeholder participation, capturing new information, and building community understanding and knowledge of climate risks. The mapping exercise also helps decision makers build community resilience and make better coastal management decisions.

Telling the Tale of Disaster Resistance: A guide to capturing and communicating the story
This guidebook provides some of the “best practices” of those who have promoted disaster-resistance efforts throughout the country, which can serve as one component in an overall adaptation outreach strategy. This publication explains what value documenting and disseminating disaster resistance provides to local governments, and provides a step-by-step guide on how to document disaster-resistance efforts, offers guidance for developing story leads, researching and documenting projects, and creating and promoting a finished product.
☞ http://www.fema.gov/library/viewRecord.do?id=1762

UKCIP’s Climate Adaptation Resource for Advisors (CLARA)
This tool is useful for U.S. practitioners who want to engage their local business community. CLARA is a web-based UK resource aimed at helping business advisors support small and medium enterprises (SMEs) in understanding and preparing for the impacts of climate change. The factsheets are designed to be accessed directly by the business community. The site provides background information on climate change, and advice on how to make the business case.
☞ http://www.ukcip.org.uk/clara/
Online Portals and Peer Exchange Platforms

Adaptation Clearinghouse
This webpage tracks adaptation initiatives, searchable by location, resource type, sector or impact. The clearinghouse also includes a list of state and local adaptation planning efforts, and provides links and brief overviews.
☞ http://www.georgetownclimate.org/adaptation/clearinghouse

Adapting to Climate Change a Municipal An Introduction for Canadian Municipalities
This report features case studies and reports on climate change adaption programs across Canada. Localities include Annapolis, Hallicax, London, Regina.

Climate Adaptation Knowledge Exchange (CAKE) website
This searchable website features: profiles of adaptation project case studies (over 100), information resources (over 300), a directory of people and organizations engaged in adaptation work, tools for decisionmakers, managers, and educators (40), and a community section including an international events calendar and advice column.
☞ www.cakex.org

Climate Access Website
This website supports a community of practice for communicators around climate issues—included within the website are case studies, a regular blog, and periodic webinars around effective climate communications. The site also hosts interactive features that enable online collaboration.
☞ http://www.climateaccess.org/

Climate Prep Blog website
This blog showcases climate change adaptation projects through compelling on-the-ground stories and tracking firsthand the progress of preparing for a changing climate at the national and international policy levels.
☞ http://www.climateprep.org

Community Adaptation Collaborative Case Studies
This webpage provides access to reports and case studies throughout the Province of Ontario. CAP delivers an intensive municipal adaptation training in climate change adaptation planning for municipal officials in Ontario.
☞ http://www.cleanairpartnership.org/cai_case_studies
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Craig Hupy
Public Services Area Administrator, City of Ann Arbor, Michigan
Chupy@a2gov.org

Craig Hupy is the public services area administrator for the city of Ann Arbor. Over the past year he has worked closely on flooding issues plaguing neighborhoods on the city’s southwest side and has attended a number of community outreach meetings with residents. His career began in Ann Arbor more than 26 years ago as a civil engineer, and since has served as a manager in various city departments. He was the manager of the city’s field operations unit from May 2009 to December 2011, where he was involved in street maintenance, sanitary sewer and stormwater collection, water distribution, solid waste and compost collection, cemetery operations, urban forestry and park operations. From 2003 to 2009, Craig managed the city’s systems planning unit, where he was responsible for coordination of the consolidation of water and wastewater treatment plant laboratories. As field superintendent in the city’s utilities department from 1990 to 2003, he was responsible for the maintenance of the drinking water, wastewater and stormwater systems. He also oversaw creation of one of the first full-pipe water system models in the state and moved water system mapping and inventory to a GIS base. He also participated in the Sanitary Sewer Overflow Task Force, which established the city’s footing drain disconnection program.

Terry Alexander
Executive Director, Office of Campus Sustainability, University of Michigan
tgalex@umich.edu

As Executive Director of the Office of Campus Sustainability at The University of Michigan, Terry is leading the campus wide implementation of the operations aspects of the University President’s sustainability initiative. Terry has successfully engaged the City of Ann Arbor to coordinate sustainability programs across campus and city boundaries. Through this process he is identifying long-term goals that will direct campus operations toward sustainable leadership among higher education. Terry is also working with The Graham Institute to build a bridge between academic/research and the operations sides of the university.

Jennifer Lawson
Water Quality Manager, Systems Planning Unit, City of Ann Arbor
Jlawson@a2gov.org

As Water Quality Manager, Jennifer manages the city storm water utility, floodplains, and urban forestry programs with an emphasis on public education and engagement. Her work has been cross-departmental, coordinating the capital management of the City’s water systems, largely focusing on stormwater programming. Prior to her work at the city, she worked at the City of Troy as the Environmental Coordinator for all City projects. She holds an undergraduate degree in Environmental Sciences, Water Resources from Michigan State University and a Graduate Degree in Landscape Architecture from the University of Michigan with a focus on Landscape as Infrastructure. She has an appointment as an adjunct professor at Lawrence Technological University, where she teaches Site Design to 2nd year architecture students.

Cresson Slotten
Manager Systems Planning, City of Ann Arbor
cslotten@a2gov.org

As Manager of the Systems Planning Unit within the City of Ann Arbor, Cresson is critical for the development of sustainable practices across disciplines throughout the cities departments. This includes the development and integration of long-range and strategic planning efforts by the systems planning unit and integration of climate adaptation efforts into capital improvements and infrastructure planning. Prior to his current position, Cresson lead the successful integration of sustainability metrics into Ann Arbor’s Capital Improvement Program.
ANN ARBOR, MICHIGAN

Jill Thatcher
City Planner and the Historic Preservation Coordinator, City of Ann Arbor
Jthatcher@a2gov.org

As a City Planner and the Historic Preservation Coordinator for the City of Ann Arbor, Jill advises owners and occupants of historic buildings on energy efficiency techniques and retrofits; coordinates private development reviews; and drafts zoning ordinance amendments to implement planning priorities. Most recently she managed initiatives to develop regulations for medical marijuana facilities and create downtown and historic district design guidelines. She currently is managing an amendment to the City of Ann Arbor Master Plan to incorporate the City’s sustainability guidelines and is assisting in the creation of a Sustainability Action Plan.

Prior to joining the City of Ann Arbor, Jill worked at the Livingston County Planning Department, where she created township master plans and park plans and completed professional emergency management training, and at the Massachusetts Department of Housing and Community Development, where she administered CDBG grants, led a statewide transfer of development rights study, and interpreted the commonwealth’s zoning enabling act for municipalities.

AJAX, ONTARIO

Stev Andis
Senior Policy Planner, Town of Ajax, Ontario
stev.andis@ajax.ca

As the Senior Policy Planner, Stev works on research and analysis of environmental and sustainability policy developed by Provincial, Regional and municipal governments, non-governmental organizations, and academia. This research informs policy recommendations on climate change, renewable energy, water quality, air quality and natural heritage among others. Stev worked on Ajax’s Official Plan to develop ecosystem-based Environment Policies and integrate an overarching climate change policy framework into the plan. Stev also reviews and provides comments on development applications to ensure the proposed development reflects the policies outlined in Ajax’s Official Plan. In addition, as a representative for Ajax on the Greater Toronto Area Clean Air Council, Stev coordinates with various municipalities and Clean Air Partnership staff to advance the knowledge and practice of air quality improvements and climate change.

Kevin Behan
Director of Research, The Clean Air Partnership
kbehan@cleanairpartnership.org

As Director of Research with the Clean Air Partnership Kevin’s research focus is on GIS and Spatial Analysis. Kevin employs spatial analysis techniques for urban sustainability and resiliency research. He has previously worked with the Centre for Spatial Analysis and McMaster Institute for Transportation and Logistics at McMaster University. There he employed simulation modeling to examine emissions produced in various scenarios of land use and urban development and to develop an understanding of the relationship between environmental pollution and health. In addition, Kevin was a GIS analyst with the Government of Ireland Forestry Department; there he surveyed forest crops and implemented sustainable harvest practices to comply with Forest Stewardship Council guidelines.
Barb Hodgins  
Senior Policy Planner, Town of Ajax, Ontario  
Barb.Hodgins@ajax.ca

Barb is a registered professional planner and geographer her professional interest is in acknowledging risks associated with population growth and infrastructure in light of the more severe weather conditions that is a result of climate change. Barb is also a member of the Great Lakes and St. Lawrence Cities Initiative’s Green CItTS Advisory Committee. Part of Barb’s present and past work is addressing problems with nearshore Lake Ontario water (e.g., excessive algal growth, curbing nutrient sources and improving water quality). Barb also has broad experience related to promoting sustainable, resilient communities including: implementing Provincial floodplain management policy for the Niagara Peninsula Conservation Authority; defending Durham Region’s land use policy in tribunals to prevent urban-type development/infrastructure in rural areas; promoting Ontario’s Greenbelt Plan; and planning sustainable development in Northwestern Ontario communities. Barb is currently involved in implementing the Environmental Policies and overarching Climate Change policy framework that she helped develop for Ajax’s Official Plan.

Jeff Stewart  
Manager of Environmental Services, Town of Ajax, Ontario  
Jeff.Stewart@ajax.ca

Jeff overseeing Ajax’s “High Priority” green and open spaces, these include a number of LEED facilities with green roofs. Recently, he has been involved in an initiative to bring residents and visitors back to the shoreline. These efforts include the revitalization of the town’s recreational beach and swimming area in Lake Ontario. In addition, Jeff has collaborated with a number of agencies and staff, and taken a lead role on developing and implementing a number of corporate plans including the Ajax’s Urban Forestry Management Plan, Waterfront Management Plan, Shoreline Improvement Plan, and Greenwood Conservation Lands Plan. Ajax is also currently in the final stages of developing an Integrated Community Sustainability Plan. Jeff has worked in both the municipal and utility sectors, he also served a term as President for the Ontario Chapter of the, International Society of Arboriculture among other service.

Michele Simmons  
Environmental Manager, City of Dayton, Ohio  
Michele.simmons@cityofdayton.org

As Environmental Manager, Michele directs the City’s Storm Water and Source Water Protection Programs. She has been instrumental in the resolution of citizen complaints, emergency response, and illicit discharge investigations resulting in the elimination of pollutants to the rivers and aquifer. Michele also coordinates City facility compliance and Department community education and outreach. Michele serves in multiple capacities on many comities within the city including: the City of Dayton Cool Energy Team, the Water Department Energy Team, the Montgomery/Greene County Local Emergency Response Council and as an Appointed member of the Clean Ohio Conservation Fund Natural Resources Assistance Council. Prior to employment with the City, Michele worked as an environmental consultant and served as an officer in the United States Air Force.
Michael Cross  
Environmental Scientist, Department of Aviation, City of Dayton, Ohio  
mcross@flydayton.com

Michael is currently the Environmental Scientist responsible for managing the Dayton International Airport’s Environmental Compliance Program which encompasses Storm Water Permit & Wastewater Permit compliance, Sustainability Program Development, and Noise Mitigation Program Implementation. Michael has been instrumental in the development of Aviation programs to maintain compliance with National Environmental Policy Act (NEPA) requirements and Construction Project Management. He coordinates facility inspections and training with tenants and operators of the various activities that occur in the airport environment. Michael is the Secretary of the City of Dayton Cool Energy Team and board member of the Honey Creek Watershed Association. When not at work, he also chairs the St. Christopher Pastoral Council.

Felicia Graham  
Environmental Scientist, Department of Water, City of Dayton, Ohio  
Felicia.Graham@daytonohio.gov

Currently, Felicia serves as Storm Water Program Manager and responsible for compliance with the City’s Storm Water Permit and monitoring storm water runoff from the over 500 outfalls. Felicia has been instrumental in the resolution of citizen complaints, emergency response and illicit discharge investigations resulting in the elimination of pollutants to our rivers and aquifer. Felicia is a member of the Department of Water and the City of Dayton’s sustainability teams. Felicia has implemented community education programs that focus on recycling, sustainability, and water resource protection initiatives. Felicia also assists City Departments with facility compliance for source water protection, storm water and underground storage tank management regulations.

Chris Lipson  
Senior Development Specialist, Office of Economic Development, City of Dayton, Ohio  
chris.lipson@daytonohio.com

Chris specializes in brownfield redevelopment and land revitalization. On a daily basis, his responsibilities include grant writing and management, project planning and design, site development coordination and contract management in the areas of demolition, remediation, infrastructure and new construction. Chris is proud to be part of a team of agencies and individuals dedicated to revitalizing Dayton’s economy. Chris received his Master’s in City and Regional Planning from Ohio State University.

Andrew Rodney  
Community Planning and Development, City of Dayton, Ohio  
Andrew.Rodney@daytonohio.gov

Andrew has been involved with regional and local transportation and land use planning efforts. As a Planner with the City of Dayton, Andrew processes land use and zoning cases, assists in administering the Zoning Code, and coordinates with staff to implement the City’s Green and Gold Strategy. He also leads Dayton’s active transportation planning efforts, including a number of bicycle and pedestrian projects, most notably authoring the City of Dayton Livable Streets Policy, the first municipal complete streets policy in Ohio, in addition to the City of Dayton 2025 Bicycle Action Plan. Prior to working for the City, Andrew worked as a Regional Planner at the Miami Valley Regional Planning Commission (Dayton, Ohio), there he was involved in a number of integrated transportation and roadway safety projects, including the Long Range Transportation Plan, Regional Intelligent Transportation Systems (ITS) Architecture, Congestion Management System, and the Dayton Roadway Safety Initiative.
Brian Kelly  
Manager of Sustainability, Region of Durham  
Brian.kelly@durham.ca

Brian recently became the Manager of Sustainability for the Region of Durham. Previously, he was the founding Director of the Sustainable Enterprise Academy, an executive education program based at the Schulich School of Business, York University. In addition, Brian has also interminably taught Business Strategies for Sustainability in the MBA program at Schulich. Throughout his over 40-year career Brian has been Director of Environment and Sustainable Development for Ontario Hydro; President of Marbek Resource Consultants; a Director in Energy, Mines and Resources Canada; and a founder of Pollution Probe. His professional specializations include sustainable development, climate change, sustainable business strategy, energy conservation and renewable energy. His background in teaching, consulting, business, government and non-governmental organizations allows him to bring a unique combination of theory and practical experience to his work.

Brian Bridgeman  
Director of Current Planning, Region of Durham, Ontario  
Brian.Bridgeman@durham.ca

As Director of Current Planning, Brian oversees the Region’s statutory obligations as a planning approval authority on a variety of documents including official plans, amendments, subdivisions, condominiums, and land severance applications. He also directs and oversees the delivery of Data, Mapping and Graphics services to the Department, including the implementation of new GIS and data tracking technologies. Brian has served as a member of the Region of Durham’s Local Action Plan Steering Committee, and currently serves as the Planning and Economic Development Department’s representative on the Region’s Corporate Climate Change Staff Working Group. He is a member of the Ontario Professional Planners Institute, the Canadian Institute of Planners and is a Registered Professional Planner.

Thomas Melymuk  
Director, Office of Sustainability, City of Pickering, Ontario  
tmelymuk@pickering.ca

Thomas has worked in municipal government for over 30 years, most of it in the planning and development field. In 2007, he became the Director of the City of Pickering’s Office of Sustainability, the first such office established by a municipality in Ontario. As Director of that Office, Tom provides overall leadership and guidance to the City’s Sustainable Pickering program, and plays an instrumental role in the on-going transformation of Pickering from a suburban community to a sustainable City. Tom is a registered professional planner and a full member of the Canadian Institute of Planners. He holds a Master of Environmental Studies Degree from York University and a Bachelor of Science Degree from the University of Toronto.

John Presta  
Director of Environmental Services, Region of Durham, Ontario  
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As a practicing engineer for 20 years, John has worked on a variety of water and wastewater projects which include both small communal servicing and large inter-regional infrastructure systems. The majority of this time was working with the Regional Municipality of Durham Works Department. Currently, as Director of Environmental Services, his responsibilities include managing the delivery of water and wastewater services for the Region of Durham that serves a population of approximately 550,000 people. Mr. Presta also actively educates and promotes the Region’s need for investment in water supply and wastewater infrastructures and currently sits on the Region’s Asset Management Committee and Climate Change Staff Working Group. His project experience includes extensive public consultation and working with stakeholders, consultants and team members to plan major infrastructure projects.
EVANSTON, ILLINOIS

Catherine Hurley
Sustainable Programs Coordinator, City of Evanston, Illinois
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Catherine Hurley is the Sustainable Programs Coordinator for the City of Evanston where she is responsible for implementing the Evanston Climate Action Plan within municipal operations and across the community. She is involved in a wide variety of projects including energy efficiency, waste reduction, water conservation, low-impact transportation, green building, and greenhouse gas reporting. She serves as liaison to sustainability organizations within the Evanston community and is responsible for securing and administering such as grants from the Illinois Department of Commerce and Economic Opportunity and the Federal Energy Efficiency and Conservation Block Grant. Catherine is also responsible for assisting City Departments and partner organizations with broader sustainability efforts, including climate mitigation and resiliency.

Joe McRae
Deputy City Manager, City of Evanston, Illinois
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As the Deputy City Manager for the City of Evanston, Joseph has several responsibilities including overseeing the City Council agenda process and City youth & young adult initiatives, serving on several boards and committees, acting as the primary liaison to Northwestern University, and serving on the City annual budget and economic development teams. Joseph earned his Master’s degree in Public Administration from the Maxine Goodman Levin College of Urban Affairs at Cleveland State University in Cleveland, Ohio and his Bachelor of Arts degree in Political Science and Public Communications from Ashland University in Ashland, Ohio.

Dick Layon
Chairman, City of Evanston Utilities Commission
dicklanyon@sbcglobal.net

As Chairman of the citizen led Utilities Commission, Dick advises City Council on policy issues related to water, sewer, energy and buildings. Dick and the Commission are currently looking at energy benchmarking for City buildings and private properties as well as an energy rating system that would be rolled out across the community to motivate private building owners to implement energy efficiency upgrades. This citizen commission plays a large role in developing policy of the city and with their support, the city council and the general public would be more supportive and proactive in the implementation of strategies.

Sat Nagar
Senior Engineer, Public Works Department, City of Evanston, Illinois
snagar@cityofevanston.org

As the senior engineer Sat maintains thorough knowledge of municipal engineering and manages the day-to-day operation of the Engineering function of the City's Public Works Department. Additionally, he prepares plans, specifications, and estimates of construction projects; attends neighborhood and other meetings to discuss proposed and approved construction projects; reviews private development plans for compliance with local public works codes and requirements; assists in preparation of the annual budget and programming of a wide variety of projects; prepares reports and recommendation for City Council approval; and maintains records and reports including technical, financial, administrative and official archive materials of the City. Additionally, Sat serves as the lead on projects of extreme complexity and all federally-funded infrastructure projects.
Eleanor Revelle  
President, Citizens for a Greener Evanston (CGE)  
er@revelle.net

Eleanor is a writer/editor, focusing for the last 10 years on climate change and sustainability issues. She is the president of Citizens’ Greener Evanston, a nonprofit organization working to make Evanston a more sustainable community—environmentally, economically, and socially—and to address climate change by dramatically reducing the community's GHG emissions. Revelle also chairs the Advisory Committee for the Evanston Climate Action Fund, a local carbon offset fund that invests in projects that help Evanston nonprofit organizations save energy and reduce their GHG emissions. In addition, she chairs the League of Women Voters of the U.S. Climate Change Task Force and developed an online climate action toolkit to assist League members around the country in promoting climate solutions at the local, state, and national levels.

Megan Hunter  
Chief Planning Officer, City of Flint, Michigan  
mhunter@cityofflint.com

Megan became Flint’s Chief Planning Officer in March 2012 and is responsible for guiding the development and implementation of the City’s first comprehensive Master Plan in over fifty years. In this role, she is also charged with crafting sustainable policies that are integrated Flint’s regulatory framework and carried out by various city departments. Prior to joining the City of Flint, Megan worked as a Senior Planner for the Community Redevelopment Agency of Los Angeles, overseeing planning and redevelopment efforts in two communities immediately adjacent to one of the busiest ports in the United States. She also spent more than seven years with the Los Angeles Department of City Planning updating community plans, writing development standards, revising code provisions, processing zone changes, zone variances, and conditional use permits, and providing case management services to developers in an environmentally responsive manner.

Rebecca Fedewa  
Executive Director, The Flint River Watershed Coalition  
rfedewa@flintriver.org

Rebecca serves as the Executive Director of the Flint River Watershed Coalition, an environmental education and advocacy group dedicated to the protection, preservation, and improvement of the Flint River and its watershed. Prior to her position with the FWRC, Rebecca worked as the Director of Grantwriting and Foundation Relations for the Ecology Center, an Ann Arbor based nonprofit that works at the local, state, regional, and national level to promote clean production and healthy communities. Rebecca originally came to Flint in 2000, when she was hired by the C. S. Mott Foundation as a program assistant for the Environment program. During her time at Mott, Rebecca became an associate program officer, co-managing a portfolio of grantees working to conserve freshwater ecosystems in the Great Lakes basin and portions of the southeastern United States.

Alicia Kitsuse  
Executive Director, The Flint River Watershed Coalition, Flint, Michigan  
akitsuse@mott.org

Alicia joined the C.S. Mott Foundation in 2010 as a Program Officer for the Flint Area Program, dedicated to addressing the challenges of climate change and creating positive impacts in Mott’s home community of Flint. The Mott Foundation’s domestic environmental grant making also focuses on Conservation of Freshwater Ecosystems in the Great Lakes. Prior to joining the foundation, Alicia held several positions as a program manager, researcher, teacher and consultant in the fields of civic engagement, community development and urban planning and has written extensively on these topics. She holds doctorate and master’s degrees in planning from the University of Southern California in Los Angeles.
**FLINT, MICHIGAN**

Steve Montle  
Fellow with the Center for Community Progress, Flint, Michigan  
SMontle@communityprogress.net

Steve is a Fellow with the Center for Community Progress in Flint. His work there centers on complex urban redevelopment projects and the leveraging of governmental and community assets to bring projects from the planning stages to implementation. Steve has previously held a variety of leadership positions in governmental and non-profit organizations with a focus on sustainability and environmental stewardship. He was honored as a White House Champion of Change for his innovative energy priorities and sustainable living practices making a greener community a possibility in any American city or town. His current work is focused on the creative redevelopment of several large-scale vacant brownfields, including innovative strategies that have the potential to save the City money while incorporating more sustainable practices that reduce municipal waste.

**GODERICH, ONTARIO**

Jennette Walker  
Environmental Services Technologist, Town of Goderich, Ontario  
jwalker@goderich.ca

Jennette has held a shared position between the Town of Goderich and Goderich Hydro since June 2007. For the Town of Goderich, she manages and monitors operations for compliance relating to drinking water, wastewater, waste management, energy conservation, watershed management, brownfield redevelopment, etc. For Goderich Hydro, she manages the Conservation and Demand Management programs. Prior to working for the Town, Jennette worked at a local engineering firm doing water quality monitoring, mapping, project research and site review.

Phil Beard  
General Manager/ Secretary & Treasurer, Maitland Valley Conservation Authority (MVCA)  
pbeard@mvca.on.ca

Phil has worked for MVCA in Wroxeter, Ontario for the past 32 years in a variety of roles. MVCA has taken a leadership role in the Maitland watershed in the developing a response to climate change. Currently responsible for leading the development of the Maitland Watershed Resiliency Project, a 40 year project to improve the resiliency of the watershed to withstand the impacts of climate change and to improve the health of forests, soil and rivers in ways that also reduce green house gas emissions.

Steve Jackson  
Water Resources Engineer, Maitland Valley Conservation Authority (MVCA)  
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Steve he has worked for the Maitland Valley Conservation Authority as the Water Resources Engineer since 2008. He has a number of roles including: modeling, flood forecasting, planning & regulation technical advice and soil & water conservation technical support. Prior to working for MVCA he worked as a consulting engineer in rural Ontario, undertaking both structural and water related projects. Steve graduated from McMaster University with a Bachelor of Engineering and Society in 2001. Steve is also an avid cyclist who enjoys biking to work.
Haris Alibašić
Director, Office of Energy and Sustainability, City of Grand Rapids, Michigan
halibasi@grcity.us

Haris directs the City of Grand Rapids’ Office of Energy and Sustainability. He also manages the State and Federal Legislative affairs for the City. Haris taught International Business, International Management, and Public Management courses at Davenport University. He taught Metropolitan Administration and Politics, Policy Analysis, and Sustainability in Local Governments courses at Grand Valley State University’s graduate program. Haris studied Economics at Sarajevo University; earned a Bachelor of Business Administration in International Business and Marketing at Grand Valley State University; Master of Public Administration at Grand Valley State University. Mr. Alibašić is a Ph.D. candidate in Public Policy and Administration at Walden University, and a recipient of the Commitment to Social Change, and the Scholars of Change doctoral scholarships.

Kyle Johnson
Facilities Maintenance Supervisor, City of Grand Rapids, Michigan
kmjohnson@grcity.us

Kyle currently resides in West Michigan, where he is a Facilities Maintenance Supervisor for the City of Grand Rapids. He began his FM career as an intern at Spectrum Health-Blodgett Hospital in conjunction with his Bachelor’s Degree in Facilities Management from Ferris State University. Alongside his supervision of day-to-day operations and capital projects, Kyle is heavily involved with the city’s creation, integration, and implementation of sustainable energy programs.

Michael Lunn
Environmental Services Manager, City of Grand Rapids, Michigan
mlunn@grcity.us

Michael has worked in the industry for over 34 years and is currently the Environmental Services Manager for the City of Grand Rapids. His primary responsibilities include wastewater, stormwater, air quality and industrial pretreatment. He provides a leadership role in the City’s move toward sustainability which includes energy efficiency and inclusion of green infrastructure in the Combined Sewer Overflow separation project. Prior to working for the City of Grand Rapids he worked for the City of Flint Michigan as the Assistant Wastewater Plant Supervisor.

Nick Occhipinti
Director of Policy and Community Activism, West Michigan Environmental Action Council
nocchipinti@wmeac.org

Trained in economics and public policy, Nick has a strong background in innovative energy thinking and energy policy. He has worked around the country for energy thought leaders including the Rocky Mountain institute, an energy policy think tank, and the Hawaii State Senate Energy and Environment Committee. In Michigan, Nick served as a liaison for Governor Granholm to the State Economic Growth and Development through Energy Efficiency Task Force, and worked to include alternative energies in the 21st Century Jobs for Michigan fund. In his current role as Policy Director for the West Michigan Environmental Action Council he has engaged community leaders, citizens, and local, state, and federal officials on today’s key environmental policy issues.
GRAND RAPIDS, MICHIGAN

Chuck Schroeder, P.E.
Assistant Environmental Services Manager, City of Grand Rapids, Michigan
cschroeder@grcity.us

Chuck has been in the civil engineering field for 30 years. Working in the private sector as a design engineer and project manager for 16 years, he was involved with numerous phases of infrastructure projects ranging from initial field investigation to final construction record drawings. His portfolio includes drainage studies, combined sewer separation, water system modeling, highway design, and treatment plant. For the past 14 years, as an employee of the City of Grand Rapids he worked first as the Hydraulic Engineer and most recently as the Assistant Environmental Services Manager. He has been heavily involved in all aspects of public works projects especially wastewater, stormwater and the ever changing regulations which the City permits must adhere to.

KINGSTON, ONTARIO

Paul MacLatchy
Director of Environment & Sustainable Initiatives, City of Kingston, Ontario
pmaclatchy@cityofkingston.ca

Paul MacLatchy has been an employee of the City of Kingston since 1999 and in his current capacity as Director of Environment & Sustainable Initiatives is responsible for Kingston’s Brownfields Community Improvement Plan, for the development and implementation of “Sustainable Kingston” – Kingston’s Integrated Community Sustainability Plan as well as Greenhouse Gas Emission inventories and action planning and for the management of a portfolio of environmentally sensitive properties and projects that includes closed landfill sites, former coal gasification properties, remediation of municipally-owned properties and the myriad of other environmental issues that accompany Kingston’s long history of industrial activity.

Yves Filion
Assistant Professor, Department of Civil Engineering, Queen’s University, Kingston, Ontario
yves.filion@civil.queensu.ca

Yves has extensive research and consulting experience in municipal and environmental engineering. Yves has been developing decision support tools and technologies to support the water and municipal engineering community in making cost-effective decisions to design and rehabilitate water distribution systems. As an international expert in water distribution systems analysis and optimization Yves expertise in hydraulics is routinely sought by PEO, scientific advisory committees for international conferences in water distribution network modelling, and the Natural Science and Engineering Research Council (NSERC) to review scientific proposal. In addition, Yves is an Associate Editor with the ASCE Journal of Water Resources Planning & Management.

Rob McRae
Watershed Planning Coordinator, Cataraqui Region Conservation Authority, Ontario
robmrcrae@cataraquiregion.on.ca

Rob is the Watershed Planning Coordinator for the Cataraqui Region Conservation Authority in southeastern Ontario, Canada. He manages a team of professional staff who undertake a program of policy development, planning and management for natural resources across ten watershed basins. Rob is a member of the Canadian Institute of Planners and is registered as a Professional Planner in Ontario. He holds a Bachelor’s degree in geography and a Master’s degree in planning from Queen’s University, where he teaches environmental planning in an adjunct capacity. Rob lives in the countryside north of Kingston, Ontario with his wife Nancy.
James Miller  
Director of Utilities Engineering, Utilities Kingston, Kingston, Ontario  
jmiller@utilitieskingston.com

James joined Utilities Kingston as Director of Utilities Engineering in 2001, bringing with him various experience in engineering management and planning and building inspection. The Utilities Engineering department James leads, is responsible for capital budgeting, long-term planning and capital infrastructure project management for natural gas, water, sewer and electrical infrastructure including approvals, design, and construction administration and commissioning within the City of Kingston. Utilities Engineering also provides technical and engineering assistance to operational groups for facilities and linear assets and is responsible for the conservation and demand management programs as well as emergency preparedness with respect to Utilities Kingston infrastructure and services.

Daniel Shipp  
Coordinator of Sustainable Initiatives, City of Kingston, Ontario  
dshipp@cityofkingston.ca

As the Coordinator of Sustainable Initiatives for the City of Kingston, Daniel manages a diverse project portfolio with the City’s Sustainability and Growth Group that includes corporate wellness, leadership development, communications, the corporate energy/GHG inventory, climate change adaptation and the development and implementation of the first corporate sustainability plan. Daniel’s education includes an undergraduate degree in Political Science and masters degree in Public Administration.

Mark Van Buren  
Director of Engineering, City of Kingston, Ontario  
mvanburen@cityofkingston.ca

Mark is the Director of Engineering for the City of Kingston. This department is responsible for the planning, design, procurement, and construction of municipal infrastructure including roadways, bridges, sidewalks, signage, bike lanes, storm drainage systems, and the technical review of land development applications within the City of Kingston. Prior to his employment with the City of Kingston, Mark was a senior project manager with Parson Corporation in Milwaukee, WI and involved in numerous water resources projects for local, state and federal government through the U.S. Midwest. Mark earned a doctorate degree in Civil Engineering with a research focus within the field of stormwater management and best management and is a registered Professional Engineer.

Jason Wills  
Coordinator, Risk Management Division, City of London  
jwills@london.ca

Jason Wills is a Coordinator in the Risk Management Division for the City of London since 2004. His education and accreditations include being a Chartered Insurance Professional (CIP) and designation by Canadian Risk Management (CRM). Jason’s primary roles include claims handling, loss prevention, contract review, internal corporate advice and staff training. Prior to working at the City, Jason was previously employed with private sector insurance companies (Claimspro - Independent Adjuster, Aviva Insurance – Adjuster, Wawanesa Insurance – Adjuster, Service Masters – Fire & Flood restoration technician). In total, Jason has over 18 years of experience with Insurance Claims Adjusting and Risk Management. When not involved in risk aversion and due diligence, Jason takes his chances with a fly rod in area streams and rivers.
MARKSHIFFLETT
Senior Water Resource Engineer, Upper Thames River Conservation Authority (UTRCA)
shifflettm@thamesriver.on.ca

Mark is the Senior Water Resources Engineer with the Upper Thames River Conservation Authority (UTRCA) and is involved with all water resources related aspects of UTRCA business including flood forecasting, maintenance and operation of flood control structures, low water monitoring, flood hazard mapping and regulations, and climate change. Mark is a Professional Engineer who graduated from the University of Waterloo with a degree in Civil Engineering. He spent approximately 10 years working in engineering consulting in both the United States and Canada, specializing in water resources and environmental fields, before joining the UTRCA in 2006. When not assisting downstream communities with flood protection, Mark uses flooded hockey rinks to practise his wrist shot.

PADDONNELLY
Watershed Program Manager, City of London, Ontario
pdonnell@london.ca

Patrick is the Watershed Program Manager for the City of London, Ontario since 2004. Mr Donnelly is a Registered Professional Planner (RPP) who has B. Sc. and M.Sc. degrees in resource management / geomorphology. He is also co-founder and a resource advisor for the Lake Huron Coastal Centre in Goderich, Ontario. He has been actively involved in local stewardship efforts for coastal communities and municipalities for over 25 years. As an environmental planner, he has previous employment experience in both provincial and regional governments as well as Ontario Conservation Authorities and in private environmental consulting. Pat combines conservation and scientific principles to influence behaviour change. When not working on improving conditions of the Thames River and Lake Huron, he manages to dip a paddle in area rivers and streams.

LONDO, ONTARIO

CARLINDQUIST
Executive Director, Superior Watershed Partnership, Marquette, Michigan
carl@superiorwatersheds.org

Carl has served on numerous regional, state, and international advisory bodies including two terms as the US Chair of the Lake Superior Binational Forum (US and Canada). As the Executive Director of the Superior Watershed Partnership (SWP), Carl works closely with the City of Marquette on a range of environmental issues including but not limited to; stormwater management, wetland restoration, beach monitoring, green space protection, sustainability, community education and climate change adaptation. He holds a degree in Environmental Management from the University of Wisconsin.

YVONNEWHITMAN
Administrator of Community Relations and Energy Optimization, Marquette Board of Light & Power, Marquette, Michigan
ywhitman@mblp.org

As the Administrator of Community Relations and Energy Optimization for MBLP, Yvonne is responsible for all of the marketing and community relations for the utility. Additionally, Yvonne serves on the City of Marquette’s Sustainability Committee. Based on the shores of Lake Superior, the publicly owned Marquette Board of Light & Power has been providing electric service to Marquette and the surrounding communities for over 120 years. MBLP has strong connections to the community and endeavors to provide economical and reliable service while protecting the environment.
**Sarah Kerton**  
Community Environmental Action Plan Coordinator, City of Thunder Bay, Ontario  
skerton@thunderbay.ca

Sarah helped coordinate the creation and implementation of the EarthWise® Community Environmental Action Plan. She has led sustainability related policy development and project management for the City of Thunder Bay for the last five years. Sarah facilitates stakeholder relations, and bridges the gap between disparate sectors. Prior to joining the City, Sarah worked for Ontario Parks, taught secondary school, and was the Vice President of Environment North. As a sessional lecturer for Lakehead University, and Board Member of Leadership Thunder Bay, Sarah ensures sustainability is on the agenda of Thunder Bay’s next leaders. Sarah will lead the creation of the City’s Adaptation Plan over the next two years.

**Charles Campbell**  
Manager Central Support Division, City of Thunder Bay, Ontario  
campbell@thunderbay.ca

Charles is the Manager of Central Support Division in the Infrastructure & Operations Department at the City of Thunder Bay. Charles chaired the EarthWise® Thunder Bay Steering Committee from 2004 to 2008, which oversaw the development of the Community Environmental Action Plan. In addition, Charles has been personally trained as a presenter for The Climate Project (TCP), by Former Vice President and Nobel Laureate Al Gore, and has delivered his informative and entertaining ‘state of the climate’ presentation to hundreds of people. He is currently, the President of Superior Renewable Energy Cooperative, and has served as a Director of the Ontario Sustainable Energy Association, and of the Thunder Bay Public Library. In prior roles he has been the CFO of Superior Credit Union, worked in an accounting firm and spent over a decade as a budget and program analyst with the Ontario Ministry of Natural Resources.

**Thora Cartlidge**  
Land Use Planner, Development Services Department, City of Thunder Bay, Ontario  
tcartlidge@thunderbay.com

Thora is active in corporate policy-making, urban planning and redevelopment proposals with the City of Thunder Bay. She has teamed with staff from various public agencies and community interests in planning for a regional food strategy, active transportation system, industrial islands rehabilitation and other healthy community initiatives identified in the City’s Strategic Plan 2011-2014. Prior to joining the City of Thunder Bay in 2007 as a Land-Use Planner, she served as Research Fellow and Associate Director to the Centre for Rural Design (U of M CRD), working for 10 years on community identity and economic resilience issues across rural and small-town Minnesota and Wisconsin. Concurrent with the CRD appointment, she was Adjunct Professor to U of M’s College of Architecture and Landscape Architecture. Thora is a Registered Professional Planner and holds a Master’s Degree in Landscape Architecture from the University of Minnesota.
THUNDER BAY, ONTARIO

Darrel Matson
General Manager of Infrastructure and Operations, City of Thunder Bay, Ontario
dmatson@thunderbay.ca

As Manager of Infrastructure & Operations, Darrel is responsible for the planning, operation and maintenance of all infrastructure in the City. Prior to this position, he was the Manager of the Environment Division, responsible for water, wastewater and recycling. Darrel joined the City of Thunder Bay in 1978 and was born and raised in the city. He also attended Hammarskjold High School and then earned his Electrical Engineering Technology diploma from Lakehead University in 1982.

Chris Walton
President, Arbora Management Services, Thunder Bay, Ontario
chris@arbora.ca

As the president and principal consultant of Arbora Management Services, Chris provides management consulting services specializing in environmental systems, sustainability planning, environmental compliance management, policy development, government liaison and project administration. He works with public and private organizations on developing integrated environment and sustainability management plans that provide the framework and tools necessary for the organization to meet their strategic goals. In addition, Chris is active on a number of industry association and non-profit community organization, serving in a variety of leadership capacities.

TOLEDO, OHIO

David E. Leffler
Commissioner, Plant Operations, City of Toledo, Ohio
David.Leffler@toledo.oh.gov

David was appointed as the Commissioner of Plant Operations in January, 2010. Plant Operations consist of the Collins Park Water Treatment Facility, a 150 Million Gallon per Day (MGD) fresh water treatment plant and the Bay View Waste Water Treatment Facility which is capable of treating 400 MGD of municipal waste water. He is responsible for a combined workforce of over 200 employees and oversees all aspects of infrastructure planning and design, engineering, budget management and construction of capital improvements. In his role as Commissioner, David manages $80 million of operating funds and approximately $30 million in capital projects annually. Prior to serving as Commissioner of Plant Operations, he served as Director of Public Utilities and as the Commissioner of Solid Waste Operations.

Patekka Bannister
Stormwater Coordinator, City of Toledo, Ohio
Patekka.bannister@toledo.oh.gov

Patekka has worked almost fifteen years protecting natural resources. She has experience in wastewater, air, hazardous materials, and storm water programs for local government and contract facilities. In her current job, she develops policies and programs for environmental compliance/enforcement. The process includes educating clients on policies and environmental compliance. Patekka has been an active member of the developing team for Rain Gardens and has served as chair of the Steering and Public Relations, Outreach and Education Committees of the Rain Garden Initiative of Toledo-Lucas County since its inception. In this role, she has participated in the planning and construction of demonstration rain gardens, encouraged local green infrastructure projects, and in the development of numerous educational materials and events. And, she continues to be involved in public relations through the launch and on-going workshops/presentations of the Rain Garden Initiative within the community. Under Patekka’s direction, the City of Toledo received a $927,971 ARRA subsidy from the green project reserve to combine with an equal loan totaling more than $1.8 million to conduct a pilot project to determine the effectiveness of bioengineered storm water controls in reducing combined sewer overflow discharges.
Melissa Greene  
Sustainability Conservationist, Lucas Soil and Water Conservation District  
mgreene@co.lucas.oh.us

As the Sustainability Conservationist for the Lucas Soil & Water Conservation District, as well as the chair of the Toledo-Lucas County Sustainability Commission, Melissa manages various projects in areas such as legislation, community development and constituent services that require the input and cooperation of many people. Additionally she has six years of experience implementing environmental initiatives at the university level, including holding leadership positions within several organizations. Melissa holds Bachelor’s Degree in Environmental Policy & Analysis and a Master’s degree in Public Administration in Environmental Management from Bowling Green State University.

RESOURCE TEAM & SPEAKERS

Dan Brown  
Research Associate, Great Lakes Integrated Science + Assessments  
Danbro@umich.edu

Daniel holds a Master’s degree from Michigan State in Nuclear Physics and a Master’s degree in Atmospheric Science from Oregon State. Before coming to work for the Great Lakes Integrated Sciences and Assessments Center at the University of Michigan last year, he worked for the Oregon Climate Change Research Institute. He has experience analyzing climate model projections and historical climate data. His primary role with GLISA is the synthesis of scientific information to help inform decision makers on climate adaptation.

John Callewaert  
Integrated Assessment Program Director, Graham Sustainability Institute  
jcallew@umich.edu

As Integrated Assessment Program Director of the Graham Institute, John is responsible for designing, implementing and overseeing the day-to-day operations for the Integrated Assessment (IA) Program. This includes the administrative, financial, personnel and planning aspects of IA activity as well as the research staff engaged in day-to-day operations. John works in collaboration with the IA faculty research teams and participates on IA projects, conducting research as appropriate, with results used in broader IA research projects. John came to the Graham Institute in 2009 after serving for two years as the Director of the UM-Flint Office of Research.

Nicola Crawhall  
Deputy Director, Great Lakes & St. Lawrence Cities Initiative  
nicola.crawhall@rogers.com

Nicola Crawhall is currently Deputy Director of the Great Lakes and St. Lawrence Cities Initiative, a binational coalition of 90 mayors representing over fifteen million people in Canada and the United States. She also serves as the Cities Initiative’s director of Green CITTs, a program to promote and profile sustainable best practices amongst Cities Initiative members. Nicola is also principal of Nicola J. Crawhall Consulting, which provides policy and government relations advice in the area of municipal environmental services. Nicola has 20 years’ professional experience in public policy development, government relations, and communications. Nicola has served as senior policy advisor to two Ontario Ministers of the Environment, where she was responsible for the development and introduction of The Clean Water Act, legislation to protect sources of drinking water. Nicola has also served as senior environmental policy advisor for the Association of Municipalities of Ontario, where she led AMO’s participation in Part II of the Walkerton Contaminated Water Public Inquiry.
RESOURCE TEAM & SPEAKERS

**Allan G. Douglas**  
Director, Ontario Centre for Climate Impacts and Adaptation Resources  
adouglas@mirarco.org

Al holds the title of Director at the Ontario Centre for Climate Impacts and Adaptation Resources – OCCIAR. He has been working in the field of climate change impacts and adaptation for 10 years and has partnered with many different organizations in Ontario and Canada to develop and deliver adaptation resources. Specializing in facilitating adaptation planning at the local and watershed level, Al has contributed content to a host of municipal climate change adaptation guidebooks over his career and has held advisory positions on a variety of climate change panels and committees throughout Ontario and Canada. Al also has expertise in climate science; climate change impact, vulnerability and risk assessment; policy development and adaptation planning in natural resource sectors.

**Mark Haggerty**  
Policy Analyst, Headwaters Economics  
mark@headwaterseconomics.org

Mark applies economic and fiscal data to real-world land-use and development challenges. He has experience as a researcher, trainer, and facilitator with an emphasis on land use and community planning. Mark is currently working with communities nation-wide to help them assess economic vulnerability to climate change, and to communicate the opportunities for building resilience in regional economies. In Michigan’s Upper Peninsula, Headwaters Economics partnered with the Superior Watershed Partnership to build a map-based data visualization showing regional economic exposure to climate change that also serves as a portal to a detailed socio-economic database and links to research, people, and organizations working to build resilience in cities and across the region. Mark holds a B.A. in Economics and M.A. in Geography from the University of Colorado.

**George Heartwell**  
Mayor, City of Grand Rapids, Michigan  
gheartwe@grand-rapids.mi.us

Now serving in his third term Mayor George Heartwell took office on January 1, 2004. During his tenure City government has “gone green”, implanting a variety of environmental measures including purchase of renewable resource energy, use of alternative fuels in City vehicles, continued attention to water quality in the Grand River and widespread implementation of energy conservation measures. In January of 2007 the United Nations recognized Grand Rapids as a “Center of Expertise” in sustainability. The Mayor has overseen a period of rapid economic development in Grand Rapids, even during an extended downturn in the Michigan economy. Mayor Heartwell also serves as President and CEO of Pilgrim Manor Retirement Community. He is married to Susan Heartwell who is the Executive Director of the Student Advancement Foundation. The Heartwells have three children and six grandchildren.

**Matt Naud**  
Environmental Coordinator, City of Ann Arbor, Michigan  
MNaud@a2gov.org

Matt is the Environmental Coordinator and an Assistant Emergency Manager with the City of Ann Arbor Systems Planning Unit. The Environmental Coordinator makes recommendations to the City Administrator, Mayor, and City Council on a broad range of environmental issues and staffs the City’s Environmental Commission. Matt has 20 years of private and public sector environmental, emergency management, and transportation consulting experience; and four years of academic and industry molecular biology research experience. He holds Master’s degrees in Biology and Public Policy from the University of Michigan and an undergraduate degree from Boston College.
David MacLeod
Senior Environmental Specialist, Environment Office, City of Toronto
dmaclol2@toronto.ca

David has over 25 years experience in the field of environmental risk management. For the last five years his primary focus has been on the issue of extreme weather associated with climate change. David led the development of Toronto’s climate change adaptation strategy – Ahead of the Storm in 2008. He is the lead staff member who conceived and is now facilitating the Toronto region’s WeatherWise Partnership, a multi-sectoral group of infrastructure owners that seeks to enhance extreme weather resilience. He facilitates an Electrical Sector Core Project Team which promotes electrical sector resilience and is a member of Engineers Canada’s “Public Infrastructure Engineering Vulnerability Committee” (PIEVC).

Prior to joining the City, David was an environmental management consultant and auditor for over a dozen industry sectors in Canada and the US. David was also an Adjunct Professor at Ryerson University, teaching in the field of Environmental Management Systems.

Andy Hoffman
Holcim (US) Professor of Sustainable Enterprise, University of Michigan
ajhoff@umich.edu

As the Holcim (US) Professor of Sustainable Enterprise at the University of Michigan Andy holds joint appointments at the Stephen M. Ross School of Business and the School of Natural Resources & Environment. Within this role, Andy also serves as Director of the Frederick A. and Barbara M. Erb Institute for Global Sustainable Enterprise. Professor Hoffman’s research uses a sociological perspective to understand the cultural and institutional aspects of environmental issues for organizations. In particular, he focuses on the processes by which environmental issues both emerge and evolve as social, political and managerial issues. He has written extensively about: the evolving nature of field level pressures related to environmental issues; the corporate responses that have emerged as a result of those pressures, particularly around the issue of climate change; the interconnected networks among non-governmental organizations and corporations and how those networks influence change processes within cultural and institutional systems; the social and psychological barriers to these change processes; and the underlying cultural values that are engaged when these barriers are overcome.

Brendon Slotterback
Sustainability Program Coordinator, City of Minneapolis
Brendon.Slotterback@minneapolismn.gov

Brendon is the Sustainability Program Coordinator for the City of Minneapolis. He leads the city’s climate action planning efforts, as well as work on a building disclosure ordinance. Brendon’s work on the climate action plan has helped identify the need in the city to focus on adaptation, and the city has begun to develop a regional partnership to apply downscaled climate data to the region and identify the needs of local government users. Brendon’s background is in urban planning, and he is a member of the American Institute of Certified Planners and a LEED-accredited professional.

Stephanie Smith
Sustainability Specialist, City of Flagstaff, Arizona
ssmith@flagstaffaz.gov

Stephanie Smith is the Sustainability Specialist for the City of Flagstaff, Arizona. Her work focuses on the development, implementation and evaluation of municipal and community sustainability policies and programming related to energy and climate and includes resiliency and preparedness planning and project implementation, energy efficiency and fleet management. Stephanie has Bachelor’s degrees in political science and geography and a Master’s degree in public administration from Northern Arizona University.
ADVISORY TEAM

Arun Agrawal
Professor at the School of Natural Resources & Environment, University of Michigan
arunagra@umich.edu

Arun’s research and teaching emphasize the politics of international development, institutional change, and environmental conservation. He has written critically on indigenous knowledge, community-based conservation, common property, population and resources, and environmental identities. His recent interests include adaptation to climate change, urban adaptation, REDD+, and the decentralization of environmental governance.

Elisabeth Gerber
Professor at the Ford School of Public Policy, University of Michigan
egerber@umich.edu

Liz’s key research interest in the GLAA-C project are to understand how cities manage or deal with aging infrastructure systems, how climate change initiatives or discussions are influenced by partisanship at the local level, and how leadership influences a city’s fiscal security. Liz has led the implementation of a public survey that went to 2,049 households across the Great Lakes Region and she is currently implementing a leadership survey which will go to 300 mayors and city managers of cities in the 8 US states and 2 Canadian provinces that make up the Great Lakes region.

Larissa Larsen
Professor of Urban and Regional Planning at the Taubman College of Architecture and Urban Planning, University of Michigan
larissal@umich.edu

Larissa’s research focuses on identifying environmental inequities in the built environment and advancing issues of urban sustainability and social justice. Some of her past research has examined urban heat islands, water consumption, and neighborhood mobilization against environmental problems. Most of her current work involves climate adaptation planning and urban heat island studies. She is leading research in Duluth and Thunder Bay evaluating how actors in the two cities are addressing climate change, specifically in response to heavy rain events that impacted both cities earlier this year.

Maria Carmen Lemos
Professor at the School of Natural Resources & Environment, University of Michigan
lemos@umich.edu

Maria’s research interests are related to the human dimensions of global change and social studies of science. She is particularly interested in understanding: the intersection between development and climate, especially concerning the relationship between anti-poverty programs and risk management and the use of technoscientific information, especially seasonal climate (El Nino forecasting) in building adaptive capacity to climate variability and change (drought planning, water management, and agriculture) in the U.S. (Great Lakes) and Latin America.

Marie O’Neill
Professor of Environmental Health Services and Epidemiology at the School of Public Health, University of Michigan

Marie is currently working on a variety of projects dealing with heat events and measuring the events, impacts, and public health responses. Marie’s work is currently leading projects in Detroit, Ann Arbor, Cleveland, and a number of other cities outside of the region. She and her teams work closely with community members, community health workers at the local, regional, and state level, and public officials and staff.
Ricky Rood  
Professor of Atmospheric, Oceanic and Space Sciences in the School of Engineering and SNRE, University of Michigan  
brrood@umich.edu

Rick’s research is focused on bridging the study of weather and climate. He is investigating how the dynamical core impacts topographic precipitation. This includes investigating specific features, viewing them as objects, and whether they are represented in the same way in different model configurations and observations. His student Evan Oswald is investigating trends in extreme heat events using quality controlled station observations. This work is being extended to gridded datasets used in climate-model downscaling. Our goal is to evaluate how well these gridded datasets represent historical trends and help to describe the uncertainty associated with projections of extreme heat in the future.

Steve Adams  
Senior Program Advisor for Climate Adaptation, ISC  
sadams@iscvt.org

Steve joined ISC as Senior Program Advisor for Climate Adaptation in October 2011. From 2009 – 2011, Steve was the Managing Director of the Climate Leadership Initiative where he managed community-based and sector-based adaptation projects in the Pacific Northwest, catalyzed the Southeast Florida Regional Climate Change Compact as a model for regional scale adaptation and co-founded the American Society of Adaptation Professionals to serve as a community of practice for practitioners working in various sub-fields of climate adaptation.

From 2007 – 2009, Steve served in the administration of Florida Governor Charlie Crist where he directed energy and climate change policy development, managed the staff of the Florida Energy and Climate Commission, and secured over $170M for Florida in energy-related funding under the American Recovery & Reinvestment Act. In 2007-2008, Steve served as the Staff Director for the Governor’s Action Team on Energy and Climate Change and played a key role in developing and passing Florida’s landmark 2008 Energy and Climate Bill (HB 7135). Previously, he served as the Policy Director for Florida’s Department of Environmental Protection where he led agency-wide policy development on issues ranging from ocean protection to energy to information technology. In 2002-2003, he served at the U.S. EPA as Senior Advisor to Administrator Christie Todd Whitman’s Environmental Indicators Initiative, an effort that resulted in the publication of EPA’s first national environmental and human health assessment using environmental indicators. In 1997-1998, he developed and implemented the FDEP Environmental Performance Management System, an initiative that twice won recognition in the Innovations in American Government program sponsored by the Ford Foundation, the Council for Excellence in Government, and Harvard’s Kennedy School of Government.

Mike Crowley  
Senior Program Officer, U.S. Climate & Environment Team, ISC  
mcrowley@iscvt.org

Michael Crowley joined the ISC in January 2011 as Senior Program Officer with the U.S. Climate & Environment team. Previously he was the Sustainability Program Manager at Environmental Health & Engineering (EH&E), an environmental consulting firm in Needham, MA. In that role, he helped clients develop robust institutional sustainability programs, and provided technical support ranging from change management to climate action planning and green building programming. Prior to his position at EH&E, Michael was the Assistant Director of the Harvard University Green Campus Initiative (now the Office for Sustainability), where he established a green building program, managed a $12 million revolving loan fund for energy conservation projects, and led the strategic planning effort to develop a greenhouse gas reduction commitment for the Faculty of Arts and Sciences. Michael Crowley currently co-teaches the course “Planning for Carbon Neutrality: Practical Methods for Greenhouse Gas Reduction” at the Harvard University Extension School.
STAFF

Beth Gibbons
Great Lakes Adaptation Assessment for Cities Project Manager, Graham Institute
Elzrenc@umich.edu

As the GLAA-C project manager, Beth is responsible for providing place-based information needed for developing and improving policy decisions and infrastructure investments related to climate adaptation in the Great Lakes Region. Beth's work includes fostering the transfer of information on climate change and community and economic resilience from the research side at the University of Michigan to city stakeholders throughout the region. Her past positions include extensive community engagement and strategic planning work in the United States and Africa. Through work collaborating with local, regional and national level stakeholders, she has developed a keen ability to communicate effectively with diverse people on a myriad of community and economic development initiatives. Beth received her Master’s degree in Urban and Regional Planning from the University of Michigan.

Missy Stults
Research Fellow and Doctoral Student, University of Michigan
missy.stults@gmail.com

As a Research Fellow at the University of Michigan, Missy is working on developing the Adaptation Chapter for the U.S. National Climate Assessment. In this role, she is working with leading climate adaptation and mitigation experts to identify major themes and trends in national climate adaptation efforts for distillation into the 2012 National Climate Assessment. Before joining the University of Michigan, Missy was the national Climate Director for ICLEI—Local Governments for Sustainability where she worked with over 600 local governments to advance their climate mitigation, climate adaptation, and sustainability efforts. She received her Master’s degree from Columbia University in Climate and Society and her Bachelor’s in Science from the University of New England in Marine Biology and Environmental Science.