Event Summary: Connecting Local Governments with Climate Adaptation Science

On May 22nd, the City of Minneapolis along with the University of Minnesota, the University of Michigan and the Science Museum of Minnesota hosted a workshop for local governments to build knowledge around expected climate change impacts on urban communities in the Twin Cities. The workshop goals were to:

1. Connect local government staff with the latest information on climate change history and future projections.
2. Understand questions that local governments have about climate trends and potential impacts and vulnerabilities.
3. Connect local government staff with research professionals to advance applied research and meet local needs.

Attendees included local government staff from Minneapolis, Saint Paul, Hennepin and Ramsey Counties, the Metropolitan Council, state agencies and researchers and faculty from a variety of fields. This workshop was funded by a grant from the University of Minnesota's Institute on the Environment.

The day began with a presentation by Dan Brown from the University of Michigan's Great Lakes Integrated Sciences and Assessments (GLISA) on historical and current climate trends in the Minneapolis-Saint Paul metro region. He gave an overview of observed temperatures in the region over the last 70 years and related shifting plan hardiness zones.

Dan also shared trends related to precipitation levels and snowfall, extreme weather occurrences, and drought. Based on these trends, the Twin Cities region can expect to see the following changes to its climate in the coming years: warmer average temperatures, warmer low and winter temperatures, shorter winters, more total precipitation and more severe precipitation events. The key potential impacts of these changes Dan identified were in the areas of public health and infrastructure damage.

Following this summary of historical climate trends, Lewis Gilbert gave a presentation on behalf of the Wisconsin Initiative on Climate Change Impacts (WICCI) on future climate projections for the Twin Cities region. According to WICCI's data, there is an 80% chance that Minnesota temperatures will increase 3 to 9 degrees by 2055. The projections also predict more intense rain events in the future, and more winter precipitation in the form of rain rather than snow.

With those historical trends and projections in mind, attendees generated a series of discussion topics for breakout sessions to apply the climate data to local decision-making. The group identified eight different topic areas for discussion: energy, stormwater, infrastructure, food & agriculture, health, ecosystems, mitigation and adaptation, and education and outreach. In two 45 minute breakout session, the groups came up with a series of key issues and research questions in each of these areas, which are summarized below.

Topic Area	Key Issues	Research Questions	Political Considerations, Action Items
INFRASTRUCTURE	-Need for more weather/climate data to plan resilient infrastructure -Impacts of changing dew point and increased humidity on cooling systems	Research needs: stormwater projections, rainwater and snowfall intensity/frequency, winter precipitation (ice storm) predictions, dew point days/high humidity	-Update infrastructure plans based on weather projections
	-Planning street layouts/dimensions for increased precipitation (winter & summer) -Better/different pavement	-Are there better strategies/chemicals/equipment for dealing with snow and ice on roads? -How to deal with contaminated snow & ice?	-Implement new infrastructure strategies, equipment, technologies for changing climate
	Population changes due to climate change	-How are we planning for population increases as people from warmer climates may begin to move?	-Planning for density and increased demand
	Housing/building issues: dealing with older buildings, updates to building codes, capacity for cooling centers	-What are the trade-offs of retrofitting old buildings vs. building new? What updates should we make to building codes to increase efficiencies?	-Update building codes based on higher efficiency goals, changing weather & precipitation events
ENERGY	-Impacts of severe weather on energy generation and transmission, reliability -Impacts of climate change on the river-water levels and temperatures- for energy and transportation	-What will the effects of climate change be on current energy generation and renewable energy (wind, solar, ground-source heat pumps, hydro)? -Where should cities be investing for reliability? Smart grid, buried vs. above-ground transmission lines, back-up systems, etc.	-Micro and smart grids for better reliability against extreme weather -Planning for extreme temperature changes, impacts on energy loads
	-Changes in energy demand due to changes in temp, increased cooling load	Need more information on: -Projected heating and cooling degree days -Project energy demand and energy pricing	-Adaptation as reactive vs. proactive -How to balance planning for increased density with adaptation
	-Changes in energy costs, energy pricing structures (time of use, etc.)	-How resilient do local governments need to be to prepare for variability in costs, reliability?	-Projected cost increases for electricity, not increased demand
	-Need for increased energy generation capacity	-Can the grid handle more demand? Can renewable energy meet the generation capacity of fossil fuels?	-Plan building hours based on cooling needs, extreme heat plans
	-Energy technology advancements (new cooling technology, renewable energy) -Flexibility in energy transmission systems, distributed generation	-How do local governments make decisions about where to invest in terms of energy systems? -How to prioritize energy improvement investments? -What is the best/most efficient cooling method?	-Update building codes to deal with new weather projections- e.g. ice vs. snow build-up
	Infrastructure design/technology changes	Research needs on: better cooling technologies, risks/vulnerability of existing power infrastructure, back-up energy technologies, local grid reliability	-More resistant/resilient grid -Need for back-up power source If gas or electricity supply is cut

STORMWATER	-Water quality vs. quantity management	How do you strike a balance between water quality and quantity issues? What are the areas where they are conflicting vs. collaborative?	-Timeframe for quantity (short) vs. quality (long)
	-Planning for increased precipitation in winter months, freeze-thaw cycles that don't allow for infiltration -Dealing with more freezing water, salt applications for safety	-What are BMPs for dealing with stormwater in winter, when there is limited infiltration? -What are the impacts of management activities for safety (salt) on water quality?	-Quantifying the benefits of BMPs when water is so cheap -Public and private role in implementing stormwater mgmt.
	-Increased flooding	-What are the impacts of a raised water table on the built environment, local businesses?	-Scale of management- property level to regional level

HEALTH	-Climate change impacts on ozone, PM 2.5 -Impacts on homeless & vulnerable populations -Ecosystem changes &vector borne disease -Heat mitigation and aging infrastructure	Research needs: -Mosquito breeding/vector borne disease risk -Drinking water contamination -Risk assessment data for air, water, heat days -New freeze/thaw cycle, impacts on water supply	-Need quality data with credible sources
	-Risk communication: the public is not convinced that heat days are a risk	How to communicate health risks related to climate change to the public?	-Policy impacts of warmers nights and longer summers
	-Drill down into the data and develop risk assessment -Projections based on data from other places, e.g. Kansas, strategies used there	-Is there adequate redundancy for Mpls/St. Paul extended drought, nuclear contamination, etc.? -What strategies have been used effectively in other communities with similar climate?	-Consider impacts on low-income communities -Need more planning

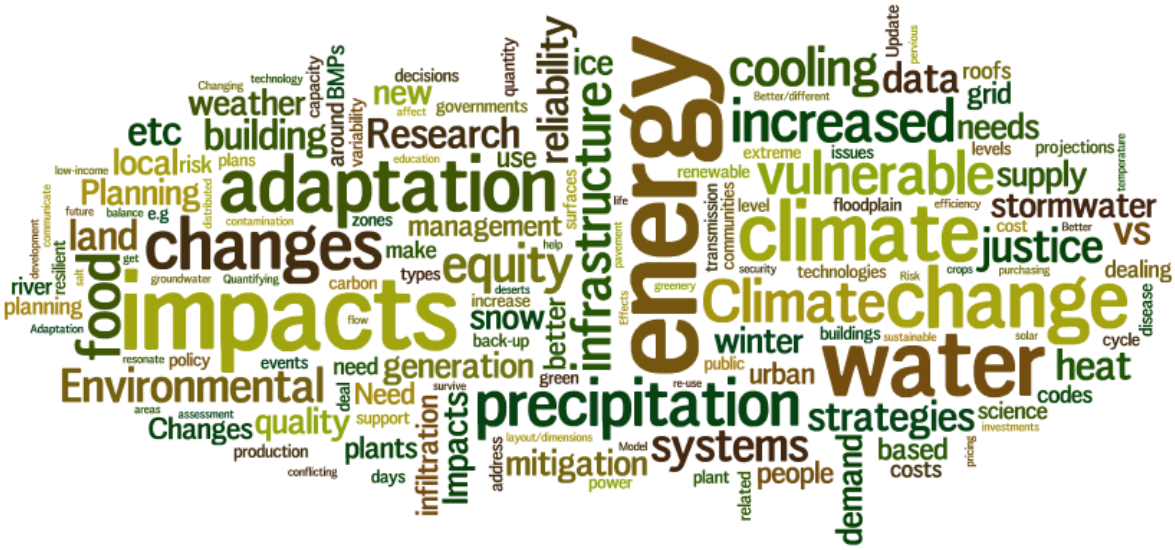
ECOSYSTEMS	-Changing plant zones -Shifting species, more new invasive species -Aggregating land for urban forests	-What do the changes in plant zones mean? What plants can survive in our zone now? -How do we avoid investments that will be impacted by future risks?	-Plant more trees- to reduce heat and impervious surfaces -Incentives and land control policy for urban forests
	-Changes in precipitation -Large rain events and infiltration, groundwater levels	-Impact of rain events on infiltration & groundwater -How can we capture upstream and winter precipitation to maintain natural water cycle?	-Retrofit streets to increase infiltration (Complete Streets, etc.)
	-Regulating beyond the 100-year floodplain	-What will the floodplain look like in the future? -Will there be more relocation and insurance costs? -How do we communicate with property owners about changes/risks?	-Education challenges to get people involved in changes -Decisions based not on science but rather aesthetics, costs
	-Projections related to river flow, water levels, impacts on other systems	Model projected river flow: water supply, power supply, floodplain management, downstream impacts	-Model river discharge to better predict risk

FOOD & AGRICULTURE	Climate change impacts on agriculture-based industries, changes in transport needs, types of crops being produced	-Data on positive changes from sustainable practices: compost, crop rotation, etc. -Shift in types of crops produced w/climate change	City-wide efforts to promote local food production: community & boulevard gardens
	Global food supply chain	-Where are the vulnerabilities in global food supply?	-Fertilizer, scarcity, late frost
	Land use: shifts in development needs, prices of farm land, demand for land for fuel/energy/food	-What impacts will climate change have on land use? -What are the conflicting demands between land use for food, fuel and energy?	-City initiatives to address food waste, promote composting
	Effects on food security	-How will changes in plant hardiness zones affect food security? What will the impacts of severe weather be on food production?	-Impacts of urban agriculture on stormwater run-off/management
	Food deserts in urban areas	-Examples of local efforts to address food deserts?	-Changing cost of food, impacts on low-income families

MITIGATION & ADAPTATION	Confluence of adaptation & mitigation strategies	-How to reduce the carbon impact of mitigation strategies? Finding the nexus, the "win-wins"	-Adaptation (cooling) conflicts with mitigation (energy, CO2, emissions)
	BMPs around renewables, distributed generation, green roofs, multi-use spaces, water re-use	Research into: BMPs for DG, solar & wind, green roofs , disease and climate resilient plants, dual purpose space usage (e.g. parking lots for stormwater storage), water re-use, grey water	-Quality of life and equity impacts on vulnerable communities -Reduce consumption & increase reliability
	Quantifying impacts of increased greenery	-What types of plants will thrive? How will seasonal precipitation variability affect plants?	-Increase greenery to address: heat island effect, stormwater, CO2
	Planning for extremes	-Research building and infrastructure science around green roofs, pervious surfaces, passive cooling, etc.	-Grid reliability- energy production vs. efficiency
	Emissions impacts of development and purchasing decisions	-Research into carbon impacts of urban sprawl -Life cycle analysis for purchasing and adaptation strategies, "carbon intensity lens" + cost	-Use for funding, policy decisions

EDUCATION, COMMUNICATION & OUTREACH	-Encouraging people to recognize the problem and take action on this issue	-How do we make this issue resonate with people? -What do these changes mean to the average resident- simplify it on a personal/local level?	-Shift the conversation from climate change to quality of life -Easier to educate young people
	-Perception that climate change is complex, all science & data	How do we make climate change and its interacting impacts more understandable?	-Better science education around climate change in schools
	-Shift from education & outreach to policy & systems change approach	What policies need to change to support environmental infrastructure changes that enable & encourage sustainable behaviors?	-Changes to zoning, ordinances, land use plans for adaptation -Policies that support white roofs, pervious surfaces, tree canopy, etc.
	-Local gov'ts need help to do more long-term planning (beyond election cycles)	-How do we get the public on board to support city decision related to climate adaptation?	-Identify communications strategies that resonate, engage residents

Figure 1: Wordle of breakout session notes



The morning concluded with a panel of climate resource providers, including:

- Kelly Muellman, MN Department of Health
- Paul Moss, MN Pollution Control Agency
- Brent Schleck, Minnesota Sea Grant

These agencies and organizations shared resources that could be of use to cities in climate adaptation planning. The day concluded with a summary of key takeaways from the event and next steps going forward. Attendees were encouraged to bring these conversations and issues up in their professional networks, to broaden the discussion of climate change adaptation.