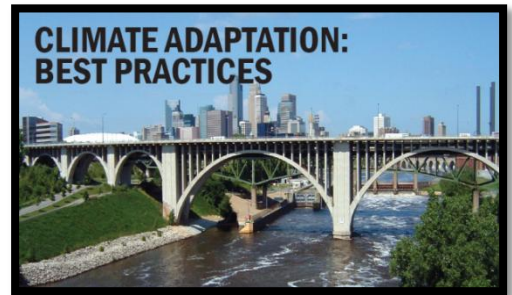


Event Summary: Minneapolis Vulnerability Workshop

On May 23rd, the City of Minneapolis hosted a workshop for staff to begin identifying the highest priority community vulnerabilities related to climate change. Bringing together staff from various City departments- including Public Works, Health, Environmental Management, Emergency Preparedness, Water Resources and Energy Management- would help to continue building support and cohesion across the City for climate adaptation efforts.



After a welcome and introduction from Sustainability Program Coordinator Brendon Slotterback and Deputy Director of Public Works Heidi Hamilton, attendees got a brief overview of the importance of climate change for cities. Brendon gave examples of recent trends in temperature, drought and precipitation, as well as changes in groundwater drawdown in the greater Metro area. With that context of why the issue matters, he shared several examples from other cities that are doing climate adaptation planning- including Chicago, New York, Seattle, Milwaukee, Portland, and the Minnehaha Creek Watershed District. These plans share a goal of minimizing and preparing for the impacts of climate change, with potential co-benefits of reduced energy costs, job creation, and improved air quality, health, water quality and quality of life.

Dan Brown from the University of Michigan's [Great Lakes Integrated Sciences and Assessments \(GLISA\)](#) gave an overview of historical and current climate trends in the Minneapolis-Saint Paul metro region. 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.

Missy Stults, a Research Fellow from the University of Michigan, then gave her presentation on understanding vulnerability, to frame the rest of the morning's discussion. The definition Missy shared for vulnerability is "the degree to which a system is susceptible to and unable to cope with, adverse effects of climate change (including climate variability and extremes)." This definition includes three core elements: exposure, sensitivity and adaptive capacity. With this in mind, conducting a vulnerability assessment is useful for a city like Minneapolis as it provides insight into the areas of the community that need attention, helps prioritize actions, provides opportunity for multidepartment and multi-jurisdictional collaboration, and establishes a structure for tracking progress.

Having given a good background on the concepts and importance of the exercise, Missy went on to explain how the process would work. Participants would first brainstorm potential areas and systems affected by climate change and the additional non-climate/non-weather factors that affect those systems (both positively and negatively). Then the group would talk about existing assets and actions being taken that would help adapt to changes in the climate. Having identified the existing programs and actions taking place, participants would then discuss areas of need to prepare for projected future climate related impacts. From the potential impact areas, participants would use a series of criteria to prioritize the key vulnerabilities. Those criteria are: magnitude of impact, timing of impact, persistence and reversibility of impact, likelihood of impact, potential for adaptation actions, importance of vulnerable populations, and distributional aspects of impacts and vulnerabilities.

Equipped with an understanding of potential impacts, examples from other cities, and an explanation of the process for the day, staff attendees launched into a discussion of climate vulnerabilities in the city.

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Systems in Minneapolis are currently or could be impacted by weather and long-term climate change:

Infrastructure	<ul style="list-style-type: none"> • Snow and ice control-> Increased salt use • Pot holes 	<ul style="list-style-type: none"> • Traffic- road access, use • Power supply
Water	<ul style="list-style-type: none"> • Stormwater- overwhelmed infrastructure • Water supply and quality 	<ul style="list-style-type: none"> • Surface waters- creek, lakes, river • Drinking water
Ecosystems	<ul style="list-style-type: none"> • Parks, recreation, landscaping & trees 	<ul style="list-style-type: none"> • Aquatic invasive species, plants
Health & Safety	<ul style="list-style-type: none"> • Emergency preparedness & response • Police- public safety • Emerging infectious/vector borne diseases 	<ul style="list-style-type: none"> • Medical system- response, capacity • Air quality • Food- access, storage
Populations	<ul style="list-style-type: none"> • Vulnerable populations- poor, elderly, very young, immigrants, new residents 	<ul style="list-style-type: none"> • Population increase, refugees • Transit dependent communities
Buildings, built infrastructure	<ul style="list-style-type: none"> • Housing- design, health • Temperature control in food businesses • Buildings- ground source heat pumps, evaporative cooling 	<ul style="list-style-type: none"> • Education- school buildings • Building inspection cycles- field workers • Design, construction changes
Planning & Land Use	<ul style="list-style-type: none"> • City budget/finances • Land use decisions- Right of way & storage for intense weather events 	<ul style="list-style-type: none"> • Regional impacts & cooperation • Limited federal/FEMA resources

Additional non-climate/non-weather factors that currently affect these systems (positively & negatively)

-	<ul style="list-style-type: none"> • Distributed generation- Currently not usable as a back-up if the grid is down, grid-tied • Power plants- Hydro, our local power plants aren't big enough to provide back-up • Vulnerability of electricity infrastructure-> electrical fires, vulnerability in distribution network • Ozone & small particulate matter increase in tandem with extreme heat, increase in emergency health • Increased intensity of wild fires -> air quality issues • Groundwater issues- Heat & drought together, increased demand, limited water sources • Drinking water- Open reservoir storage, algae bloom increase, have filters to eliminate most of the algae • Mitigation & adaptation- conflicts between these two
+	<ul style="list-style-type: none"> • Newer populations may be more adaptive to hotter/new/extreme climates • Minneapolis' active structure of neighborhood orgs/associations • Experience with collaboration, working between departments on emergency response <ul style="list-style-type: none"> ◦ Emergency disaster plans that have been tested (35W bridge, humbled by those experiences) • Local food initiatives- diversity of food options, resilience • Organized network of hospitals- Surge capacity plan

Actions the city is taking to prepare for existing and projected future climate related impacts:

- Heat response plan: <http://www.minneapolismn.gov/health/preparedness/extremeheat>
- Small green business program: http://www.minneapolismn.gov/business/business_green
- Incentives for tree planting in commercial areas
- Emergency medical response plans- Hospitals have a network, coordination

System needs in order to adapt to climate change:

- Money-> stormwater storage, infrastructure
- More culturally appropriate education/outreach on the potential impacts of & response to extreme heat
- Knowledge of cooling centers with generators (that back-up cooling systems)
- Need for back-up to communications systems: charging stations, wireless phone provider capacity, etc.
- Information from Xcel about infrastructure vulnerabilities

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Attendees then embarked on a conversation about a series of potential climate impacts that present the city with the most vulnerability.

- Extreme heat -> Human health, Grid security, Lack of perceived threats
- Extreme precipitation -> Stormwater systems, Property damage
- Drought-> Ecosystems

Heat	Impacts	Non-Climate Factors
	<p>Health & Safety:</p> <ul style="list-style-type: none"> • Public safety: stress on police & fire department, barriers to mobility & access • Crime (real and perceived) • Vacant homes- Residents going North to cabin, related crime risks • Getting into homes when windows are shut and locked • Population w/out air conditioning- Passive, alternative cooling strategies • Ozone increases: increased respiratory hospitalization, damages to natural ecosystems • Disease/vectors expanding or present for longer periods • Public respite locations- Identifying private buildings that are accessible & cooled <ul style="list-style-type: none"> ○ Pet accessible spaces, capacity to accommodate pets ○ How to get people aware of, willing to use public cooling • Increase in forest fire: decreased air quality, push factor for population change • Food preservation and storage- keeping food cold • Air quality – alert system <p>Buildings & Infrastructure:</p> <ul style="list-style-type: none"> • Buildings with evaporative cooling • Ability of power plants to keep up with temperature rise • Natural infrastructure – Street trees • Freeway buckling – traffic re-routed to city streets • Illegal fire hydrant opening -> decreased water pressure • Building code- properties unable to withstand heat • Emergency – internal and external; increased competition for services <p>Other:</p> <ul style="list-style-type: none"> • Ecosystem degradation • Recreation • Power outage- Heat & storm event, health vulnerabilities due to impact of extreme heats • Heat vulnerability & tree canopy: Compounding losses due to Emerald Ash Borer 	<ul style="list-style-type: none"> • Unemployment • Homelessness • Lack of transportation, mobility • Pets (people don't want to leave them and go to cooling centers) • Language barriers • Cultural barriers • Social isolation • Vulnerable populations: poor, aging, youth, non-English speaking
		Existing Assets
		<ul style="list-style-type: none"> • Strong neighborhood association network • New residents may have experience w/heat • The city has experienced major disasters in the past 10-12 years -> awareness of risk, experience activating responses • Well-networked hospital system • Strong inter-institutional collaboration • Incentivizing tree planting • Heat response plan • Ongoing outreach (needs expansion) • Small green business matching grant • Water filters addressing taste/smell concerns

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Precipitation	Impacts	Non-Climate Factors
	<p>Health & Safety:</p> <ul style="list-style-type: none"> • Water quality, need for more water treatment • Basement flooding -> mold -> health issues • Increased water borne disease • Vector borne disease- Increased mosquito population ,other insects • Immediate public health risk of flooding- Risks of exposure to bacteria • More swimming and water evaporation -> increased vector-borne disease <p>Infrastructure/Transportation:</p> <ul style="list-style-type: none"> • Flooded streets & access for vehicles, especially emergency vehicles • Streets designed to fill up to the curb, beyond that homes are vulnerable • Impacts on homeowners- Property owners and flooding • Stormwater tunnels- Overburdened, vulnerable to collapse <ul style="list-style-type: none"> ○ Potential to add more redundancy to that system • Industrial facilities along the River - runoff contaminants • Sewage overflow <p>Ecosystems:</p> <ul style="list-style-type: none"> • Heavy organic load into the river with increased precipitation/flooding • Increased organic loading (severe storm bringing down materials) • Increased localized flooding- Potential contaminants in the water • Risk to property owners along the creek with overflows, flood, erosion • Green infrastructure- Vulnerable to heat, drought, extreme precipitation • Vulnerability to landslides: Decreased tree canopy, saturated soils • Ground water impact (from infiltration) <p>Snowfall:</p> <ul style="list-style-type: none"> • Freeze-thaw cycles, ice that stays on roof, increased vulnerability • Shut down operations, snow removal challenges, emergency response mode • Limited mobility- Schools closed due to limited bus access • Buildings are engineered to the existing snow code • Risk of roof collapse based on unpredictable snow load • Buildings not built for new codes or increased snowfall <p>Other</p> <ul style="list-style-type: none"> • Impacts on water recreation, decreased access, increased risk • Groundwater impact from infiltration 	<ul style="list-style-type: none"> • Public expectations about risk, education • Increased outreach to business/industry sector • Language barriers • Land use – urban built environment and rural agricultural industry
		Existing Assets
		<ul style="list-style-type: none"> • Stormwater flood reservoir capacity • Street grid improves mobility/access • Emergency department reviewed refinery, manufacturing sites in Mississippi flood plain • DNR is mapping seepage infiltration and flows • Stormwater utility • 95% disconnected from combined sewer and stormwater system • Separation of stormwater and drinking water systems • Built-in overflow capacity of drinking water storage reservoirs, other storage for stormwater • New State requirement for additional on-site stormwater storage capacity for new development

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	Impacts	Non-Climate Factors
Drought	<ul style="list-style-type: none"> • Vulnerability to street trees- Don't have capacity to water them <ul style="list-style-type: none"> ○ Limited capacity of residents to care for city trees • Drinking water and irrigation demand -> river level decline • Lead exposure in yards in drought situations, dry lawns • Use of fertilizer to try and mitigate dry lawns • Increased fire risk, water quality impacts • Recreational facilities- Limited use of lakes, park buildings and fields • Impacts on invasive vs. native species from drought 	<ul style="list-style-type: none"> • Language and cultural issues • Built environment impacts w/heat - urban & rural
		Existing Assets

Needs:

Within each of the impact areas, attendees then identified additional needs. *Additional funding was identified as a need throughout.*

Heat	<ul style="list-style-type: none"> • Providing programs that address air quality • Better education and outreach to residents- to combat the perception that heat is not a "real" threat • Tree canopy inventory- Where could we plant more trees, understanding land use, strategy that takes it into account <ul style="list-style-type: none"> ○ Need for concentrated tree canopy in areas of poverty 	<ul style="list-style-type: none"> • Understanding of social & community networks & key organizations <ul style="list-style-type: none"> ○ Use those networks for awareness of community needs • Understanding on where generators exist in the case of grid failure • Strategy for communications with power failure • Fees on cell phones to have carriers install emergency systems • Burying the utilities, introducing micro-grids
Precipitation	<ul style="list-style-type: none"> • Identify potential storage capacity throughout floodplain • Identify vulnerable areas: stormwater & flooding problem sites • Incentives for rain gardens, homeowner/property owner stormwater management, along with regulations • More education for rate payers on infrastructure costs • Greater onsite stormwater management, overflow management • Talk to Xcel about system and technical vulnerabilities 	<ul style="list-style-type: none"> • Dealing with leaf drop- Catch basin to prevent drain clogging <ul style="list-style-type: none"> ○ Street sweeping strategies to deal w/resulting phosphorus bloom • Increased outreach to business/industrial sector • Review load-bearing codes for snowfall • More info on how to manage "green infrastructure" • Synergistic review process for planning and stormwater depts. • Increased grid redundancy
Drought	<ul style="list-style-type: none"> • Tree canopy: Strategy for what to plant, where & what species • Plan to deal with and maintain city trees: Outreach to property owners to water, stormwater mgmt. strategies for Blvd. trees • Integrate stormwater management into street planning- Storage and treatment, multiple uses of land, both public and private • Coordination between Public Works & Planning • Plan for density-> Changes in stormwater ordinances and rules • Groundwater as drinking water- What's our capacity? • How do we more efficiently & better use our existing resources? • Exposed soil- Lead contamination for children <ul style="list-style-type: none"> ○ Train our housing inspectors to address this issue 	<ul style="list-style-type: none"> • Better understanding of where our water is going • Broader conversation with partners: Park Board, School Board, County, Met Council, watershed orgs, state agencies (DNR, PCA, MDH, MNGS), Chamber of Commerce • Improved coordination- disconnect between entities, conflicting priorities & programs, clarity of regulations • Incentives to addition to regulation/ordinance <ul style="list-style-type: none"> ○ Are green space & stormwater management policies coordinated? • Use of grey water- allowing cisterns for re-use, toilets • State zoning codes need to be updated and responsive

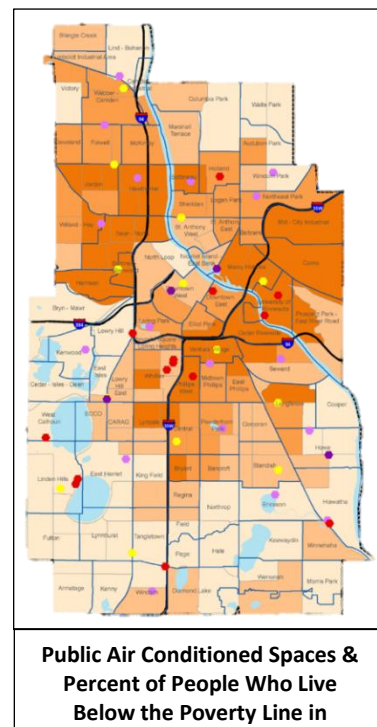
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Identifying Strategies to Reduce Vulnerability:

The last segment of the morning was spent discussing potential strategies for reducing vulnerability within the various impact areas. Due to time restraints there was not a full discussion of all the impacts, but city staff did identify priority areas in terms of vulnerabilities to focus attention and staff time.

Extreme Heat & Human Health

- Assess back-up capacity at public places used for cooling during heat waves
 - *Red Cross has a list of shelters for cooling capacity, with generators
- Look at opportunities to use fire hydrants for cooling/misting (intentional use)
- Heat response plan includes a number of efforts such as conducting outreach to vulnerable people at their places of residence
- Intentional planning around trees and vulnerable communities – working with Park Board
- Cool/reflective/green roofs (findings from the U that could be utilized to enhance or inform areas where heat island strategies could be focused)
- Air conditioning recycling program (those from window units to central air) – get units to the most vulnerable
- Maybe a loan program to get people access to air conditioning
- Need strategies to ensure that inspectors, public works folk, and others are safe during extreme heat (doing our work in the field during hot days)
- Reviewing safety policies for field workers – field worker health
- Maintain outreach into the communities through networks and linkages that are currently utilized
- Identify strategies to reduce air pollutants; identify strategies to address ozone-health days



Extreme Heat & Grid Security

- Understand the vulnerabilities and developing strategies – bringing in partners like utilities and PUC
 - Getting metro partners together with PUC and sitting down with Xcel to talk about different types and levels of vulnerability (partnerships)
 - Microgrids might be a strategy
 - Demand side management will likely be a strategy
- Peak shaving (which goes to diesel generators) so need to look at alternative shaving techniques or demand response techniques which do not lead to air quality issues
- Evaluation of government buildings for back-up capacity
- Strengthen and practice existing communications strategies for city employees and affected areas

Identifying Key Vulnerabilities: Decision-Making Criteria

What are the highest priorities for action?

1. Key vulnerability- Human impacts, public health
2. Planning for power outage & extreme heat- Understanding key buildings, preparing for brown-outs, black-outs, back-up systems, power capacity for cooling
3. Public understanding/perceived threat of health risks due to extreme heat
4. Street trees & extreme heat- Strategy to manage heat