Vulnerability Matrix

adapted from Climate Action Planning by Boswell, Greve and Seale Chapter Chapter 6

SECTORS	EXPOSURE *What climate change effects will a community experience?*	SENSITVITY *What aspects (people, structures, functions) of a community will be affected?*	POTENTIAL IMPACTS *How will climate change affect the points of sensitivity?* ***INVENTORY:*** Permanent/ reversible? Critical to regular services and function? Duration? Extent (area/# of people)? Level of disruption?	ADAPTAIVE CAPACITY *What is currently being done to address the impacts?* ***INVENTORY:*** Resources: Policy- audit/ expertise/Tech Innov/Econ Flexibility/ Community cohesion Barriers
>Points of Sensitivity> *CAP Box 6.2 pp 186-7* *Essential Facilities* *Transportation systems* *Lifeline utility systems* *High potential loss facilities* *Hazardous material facilities* *Vulnerable populations* *Economic elements* *Areas of Special consideration* *Historic and cultural resource areas* *Natural resource and biophysical systems* *Other important facilities*	*Seasonal Impacts* *1.winter warmer more rain than snow (ice storms)* *2. 25% increase in large rainstorms* *3. most rain in spring and fall* *4. more sewer overflows, more polluted stormwater, reduced air quality* MMSD Biodiversity Report: Department of Natural Resources (WDNR) used "down-scaled" global climate models that indicated a warming trend and predicted climatic changes in Wisconsin. By 2050, the authors predict an average annual temperature increase of 6 to 7 degrees Fahrenheit (°F) in the state over 2006 temperatures. Increases in precipitation, and especially an increase in the number of large storm events, are also predicted. The proportion of winter precipitation events is expected to be more rain or freezing rain, rather than snow. The report considered the potential impacts of climate change on natural resources, development, and the adaptation of natural and human systems in response to those changes. Temperature and precipitation changes are expected to impact Wisconsin's natural environments, agricultural and developed lands in some of the following ways: ● Plant hardiness zones and associated	MMSD Resilience Plan 2019 SIX TOP RISKS p.27 Identified by 4 step process narrowed down from 12 to 6 FINANCIAL CONSTRAINTS Budget constraints due to tax policy (infrastructure investment, public workforce shortage, etc. SOCIAL EQUITY Social issue due to segregation: inequalities, crime and violence. VULNERABILITY OF CRITICAL INFRASTRUCTURE Risk associated with aging infrastructure and infrastructure failure (pipes, buildings, bridges, highways, communication networks, industrial areas, etc.), significant and rising costs of maintenance and repair CLIMATIC HAZARD Climatic events (flooding, electrical storms and	**SCR-CDR** *p 35* ***5.10a Climate Crisis Impacts in Great Lakes Region*** *The climate crisis impacts in the Great Lakes region has led to it being significantly warmer and wetter than other regions of the contiguous U.S. Impacts of these changes include:* *Chronic flooding, which degrades transportation, water supply, and building infrastructure;* 1. *Increased periods of droughts and heavy precipitation, causing significant variability in Great Lakes water levels;* 2. *Changes in the direction of seasonal wind patterns and "lake-effects" storm events;* 3. *Shifts in animal and plant species vitality and biodiversity, particularly in those species dependent on cold climates;* 4. *Increased incidents of harmful algal blooms (HABs)- which are proliferations of species of algae that decrease oxygen concentrations in the waters resulting in "dead zones" and may produce toxins that are harmful to humans and animals- resulting in increased incidents of fish kills;* 5. *Greater proliferation of invasive species of plants, animals, fish, and microorganisms; and*	As projects are identified**, key performance indicators** should be created to demonstrate how effectively the project is addressing the action it is related to. The indicator should include a **baseline, a target/goal, and a timeframe** for when the target should be met. Because projects are likely to vary substantially, evaluating the impacts of the Plan is particularly challenging. **Indicators:** **Cost Avoidance** *This relates to the "return on investment" of a project by comparing the capital expenditures invested in the project with the costs incurred if a risk materializes and nothing is done.* **Quality of Life** *This relates to the improvement of specific social-based indicators such as housing, income, jobs, education, engagement, health, and life satisfaction.* **Environment** *This relates to evaluating the actions by measuring indicators that track impacts on natural systems such as land, air and water.* **Population** *This relates to the number of people, or a subsection of the population that benefit from a particular action or project.* MMSD Resilience Plan 2020 One of the ways we fight the effects of climate change is through climate adaptation. These are actions we take to

What should local governments include in a Risk and Vulnerability Assessment? *A R&VA is intended to act as a baseline to inform local governments on the development and implementation of their CCAPs. It provides an overview of their current climate and its hazards. The R&VA also provides an overview of how these are likely to change in the future as a result of the impacts of climate change. One of the most important benefits of the R&VA is that it highlights sectors within the local government area that are currently being impacted by climate hazards, to what degree, as well as how, and to what degree they could be impacted by climate change in the future. In addition to this the document also typically provides an indication of which population groups are most vulnerable to the impacts of climate change both currently and in the future. It is important to note that a R&VA does not provide any actions to address the impacts of climate change on vulnerable sectors and population groups. This detail is instead captured in the CCAP. Key aspects to include in a R&VA are highlighted below:* ***Local government context:*** *The R&VA should provide an overview of the local government context. This includes providing a general description of the local government organisation as well as information on its location, geography, official boundary and land area (usually accompanied by a map). Information on the state of the built environment (roads, infrastructure, housing etc.) should also be included. The context should also provide information on the current and projected population for the next five, 10 and 20 years as well as information about the Mayor or equivalent legal representative authority including their term length and start and end month and year. Lastly, it should also provide an overview of the area's key economic sectors and socio-economic status.* ***Historical climate information:*** *The R&VA should follow this with an overview of the historical climate experienced in the geographical boundary outlines of the local government context section. This should include a comprehensive overview of the seasons as well as rainfall patterns. If available, detail on the average rainfall per month should be included along with the average temperature per month and the wettest, hottest and coldest days on record. This information will serve as a baseline for how much the climate is predicted to change.* ***Projected climate data:*** *The R&VA*	wildlife will shift to the north. • Non-native species from the south will shift north, expanding into Wisconsin. • Opportunistic species, such as the European starling, could benefit, and will threaten Wisconsin's biodiversity. • Wisconsin's water resources will be impacted by decreasing ice cover, increased water levels (in southern Wisconsin), and decreased water levels in northern Wisconsin. • Lake Michigan coastal waters will experience decreased ice cover, changing water levels, and increases in wind strength, leading to shoreline erosion and recession and reduced coastal wetland biodiversity. • Heavy seasonal rainfall will lead to increased runoff and nutrient/sediment loading into streams, lakes, and wetlands. This will result in more blue-green algal blooms and a decrease in wetland biodiversity. • Rising stream temperatures will impact fish and other aquatic species that require cold water. • Decreases in soil moisture will threaten Wisconsin's amphibian populations. The consensus is that regional biodiversity will face a serious threat with changing climate. A focus on planning and implementing GI will help with the adaptation to these changes. Implemented now, GI will	tornadoes, cold snaps) which impact existing assets. ABILITY TO ADAPT TO JOB MARKET CHANGES Risk of non-alignment of skills, competencies and demand. The need to maintain local skills and human capital (competitive workforce training and regional attractively) to an evolving labor market DISTRIBUTION OF PUBLIC SERVICES Ability of public services to meet basic needs (accessibility, equitability and effectiveness – – – – – – – – – – – – – – – SEE ALSO SECTORS: **>Points of Sensitivity>** ***CAP Box 6.2 pp 186-7***	*6. Adverse impacts to local and regional economies that are dependent on winter recreational and tourism income.* *Climate-related chronic flooding in the Great Lakes region is degrading water quality in urban centers by increasing pollution from stormwater runoff and burdening the freshwater and wastewater treatment systems. Elevated concentrations of lead, other contaminants, E.Coli, and other pathogens are being found in urban drinking water supplies. In rural areas, chronic flooding degrades regional water quality by increasing runoff from concentrated animal feeding operations (CAFOs) such as hog and chicken farms and heavily worked agricultural soils containing farming-related contaminants (herbicides, pesticides, fertilizers, and others). Surface water pollution from these non-point sources include pathogens, sediments, nutrients, lead, minerals, and many other contaminants. Groundwater basins connected to the Great Lakes are also receiving these contaminants and spreading pollution impacts throughout the watershed.* *During the climate crisis, the rural areas of the Great Lakes region is negatively affected by lower water levels in the Great Lakes, and their associated rivers and streams. In periods of drought, the natural aquifers' replenishment will be significantly reduced while water usage will increase possibly resulting in severe limitations on the availability of potable water in this region.* **Mitigation** **Adaptation** **Suffering**	combat climate change and adapt to the changes it brings. Climate adaptation plans are long-term plans that include goals, objectives, action plans, and a multitude of other steps groups will take to adapt to the new conditions that climate change brings. We use these plans to make sure that our neighborhoods are ready for storms and floods, that our community's needs are met in emergency planning, and that our needs are included in policies passed on the state and local level. Normally climate adaptation work focuses on practical actions to manage risks from climate impacts, framing resilience within the scope of disaster and crisis response. For example, preparing communities for extreme weather events that increase with climate change. We want to do that too, but we want to take a more transformative approach to climate adaptation that accounts for the inequities already in our communities and moves to reduce or minimize further harm through reducing or eliminating the kinds of emissions that create climate change. ***NAACP p 17*** Evaluating Adaptive Capacity Identify an action in progress, or readily implemented to address the potential climate change impact. Evaluate the time and resources needed for implementation if a policy or program has not been implemented. Assess the extent to which existing policy or program addresses potential impacts. (enough?) Note the degree to which an existing policy or grogram could be strengthened ***CAP. Box 6.3. p 190***

should include an overview of the anticipated manifestations of climate change in the local government region. This should incorporate information on projected changes in temperature and rainfall patterns (as previously noted, some regions will experience less rainfall while some will experience more, and almost all regions globally will experience a shift in the timing of their rainfall), as well as the degree of sea level rise anticipated in the case of coastal local governments. ***Current climate hazards experienced by the local government.*** *The R&VA should highlight the most significant climate hazards faced in the local government's jurisdiction, and include an overview of the current risk level (both probability and consequence) associated with each hazard as well as its social consequences.* ***Key sectors, services and population groups impacted by current climate hazards.*** *The R&VA should indicate all relevant sectors, assets or services most impacted by current climate hazards affecting the local government, as well as the magnitude of impact for each. This will highlight the sectors currently most at risk to climate impacts currently being experienced.* ***Anticipated future climate hazards.*** *Once the current hazards and their impacts on sectors and vulnerable groups has been established, the R&VA should provide detail on how climate change will likely affect the intensity, frequency and timescale of each hazard (as a result of climate change). The expected change in frequency and intensity is typically measured on a scale of 'Increase', 'Decrease', 'No Change' and 'Not Known', whilst the timescale for the expected changes is typically measured as 'Immediately',' Short-term' (by 2025), 'Medium-term' (2026-2050), 'Long-term' (after 2050) and 'Not Known'.* ***IAF***	help to mitigate the potential negative effects of increased temperatures and precipitation events (Gill et al 2007).			***FEMA:*** ***Infrastructure Indicators for Emergency Planning***
BUILT ENVIRONMENT	EXPOSURE *What climate change effects will a community experience?*	SENSITVITY *What aspects (people, structures, functions) of a community will be affected?*	POTENTIAL IMPACTS *How will climate change affect the points of sensitivity?*	ADAPTAIVE CAPACITY *What is currently being done to address the impacts*
Infrastructure	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to		https://urbanmilwaukee.com/2020/02/22/lake-michigan-at-record-water-levels/#comment-1567618	Hazard Mitigation plans/Gap Analysis AOC MKE Estuary: https://dochub.com/brichards1dochub/ba539Oa/milwaukee-bui-removal-timeline-2018-pdf

	2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect			https://dochub.com/brichards1dochub/9YN79xV/mmsd-brown-bag-1-22-19-pdf Electrify Everything: https://e360.yale.edu/features/to-cut-carbon-emissions-a-movement-grows-to-electrify-everything
Transportation:				
Roadways, **United States:** Currently the world leader in urban passenger transportation CO2 emissions, with 670 megatons annually, the U.S. is projected to lower these emisions to 560 megatons by 2050 because of slower population growth, higher fuel efficiencies, and the decline in driving per person that has already started as people move back to cities. But this pace can be sharply accelerated with more sustainable transportation, dropping by half to 280 megatons, under the High Shift scenario. For the U.S. in particular, this scenario includes not only mode shifting but also considerable reductions in urban kilometers of travel per person through urban recentralization and substitution of telecommunications for	Flooding Heat/thaw extremes		Job access/basic needs access/enjoyment	To become a successful, efficient transit- oriented city, an urban area needs to supply a sufficiently high level of rapid transit services. A reasonable approximation of these services is the kilometers of urban rail and high-quality bus rapid transit trunk lines, which this study considers together with frequency and capacity. The High Shift scenario focuses in part on increasing the ratio of rapid transit kilometers per million urban residents (the “Rapid Transit per Resident” or RTR) in emerging economies closer to the levels found today in advanced developed economies and to boosting it further in wealthy countries where it falls short of current global best practice. P 11 https://itdpdotorg.wpengine.com/wp-content/uploads/2014/09/A-Global-High-Shift-Scenario_V2_WEB.pdf

travel. https://itdpdotorg.wpengine.com/wp-content/uploads/2014/09/A-Global-High-Shift-Scenario_V2_WEB.pdf				
Airports,	Fuel availability/air quality:	visibility, lift, surface disruptions		
Marine Ports,	Extreme lake storms/lake level changes	Usability/ economic loss		Repair or retreat?
Trains.	Extreme storms/ heat/thaw	Erosion of rail bed/blockage		
MMSD Jones Island	Extreme lake storms/lake level changes Land flooding	Sewage treatment threatened/ integrity of infrastructure		Repair or Retreat?
Buildings and Planned development	EXPOSURE *What climate change effects will a community experience?*	SENSITVITY *What aspects (people, structures, functions) of a community will be affected?*	POTENTIAL IMPACTS *How will climate change affect the points of sensitivity?*	ADAPTAIVE CAPACITY *What is currently being done to address the impacts*
Businesses *COVID -19* *https://www.wuwm.com/post/coronavirus-disrupting-supply-chain-heres-what-companies-can-do-about-it?utm_source=ActiveCampaign&utm_medium=email&utm_content=Coronavirus%3A+How+It+s+Impacting+Wisconsin&utm_campaign=20200313-REWIND#stream/0*	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	HVAC, interruption of energy supply Structural Integrity /communications interrupted/ supply chain interruption		**MMSD:** Create workforce development opportunities and improve low-income housing by creating and expanding training programs for under- and unemployed residents. *New Action* *To Be Scaled Up* *Municipalities # Steps for implementation will be identified with partners. ***RFMKE: pp17-19*** ***Land and Urban Ecosystem Sustainability Challenges*** • ***Targeting state subsidies to existing urban areas could spur quicker redevelopment***

				and job creation while conserving our natural eco-systems. ***CCPR Emissions:*** ***Encourage Energy Efficiency Among Low-Income Households*** ***Strengthen Green Building Standards on City-Financed Projects*** 1. ***PACE-financed projects*** 2. ***City-subsidized projects*** 3. ***New municipal buildings*** Ann Arbor Plan for All Electric: https://www.a2zero.org/wp-content/uploads/2020/03/A2Zero-Carbon-Neutrality-Strategy_DRAFT_march-20-2.pdf
Residences	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	HVAC, interruption of energy supply Structural Integrity/ communications interrupted		https://urbanmilwaukee.com/2020/02/18/poor-quality-housing-causes-health-problems/ https://ppi.communityadvocates.net/policy-projects/healthy-housing-initiative.html https://www.sierraclub.org/articles/2020/02/forward-looking-cities-lead-way-gas-free-future
Community Services:	EXPOSURE *What climate change effects will a community experience?*	SENSITVITY *What aspects (people, structures, functions) of a community will be affected?*	POTENTIAL IMPACTS *How will climate change affect the points of sensitivity?*	ADAPTAIVE CAPACITY *What is currently being done to address the impacts*
Hospitals,	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to	HVAC, interruption of energy supply Structural Integrity/ communications interrupted	Increased disease vectors	https://docs.google.com/document/d/1ZZy99xrr_L00Apw54Kstt1Pi8k9NwooWMzcXietqOSw/edit

	2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect			Green Hospital design https://www.nxtbook.com/dawson/greenroofs/lam_2018winter/index.php#/20
Schools,	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	HVAC, interruption of energy supply Structural Integrity/ communications interrupted		
Fire,	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	HVAC, interruption of energy supply Structural Integrity/ communications interrupted		
Police	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case -	HVAC, interruption of energy supply Structural Integrity/ communications interrupted		

	worst case? Rapidity and place of change Air Pollution Heat Island effect			
SOCIAL JUSTICE ***Equity*** *What do we mean when we talk about* ***equity*** *in climate adaptation planning? In most cases, existing climate change adaptation plans and policies do not include the specific needs of frontline communities, or more specifically, African Americans, people of color, women, people with disabilities, people who are low-income, young people and people who are elderly, etc. We believe that frontline communities can create their own plans, or that they should be an integral part of the formal planning process, so that those plans equitably meet community needs.* ***NAACP p 17,18*** **Climate Change Mitigation + Adaption + Deep Democracy + Equity = Resilience** ***NAACP p 18***	EXPOSURE *What climate change effects will a community experience?*	SENSITVITY *What aspects (people, structures, functions) of a community will be affected?*	POTENTIAL IMPACTS *How will climate change affect the points of sensitivity?*	ADAPTAIVE CAPACITY *What is currently being done to address the impacts*
Environmental Justice Environmental justice is the fair and equal treatment of all people regardless of race, color, national origin, gender, sexual orientation, gender identity, ability, or income level, etc. in the development, implementation, and enforcement of		**Frontline communities** are groups of people who are directly affected by climate change and inequity in society at higher rates than people who have more power in society. They are "on the frontlines" of the problem. For example, people of color, people who are low- income, who have disabilities, who are children or elderly, who are LGBTQ, who identify as	• Climate change can exacerbate the impacts of air pollution that frontline communities often face – leading to more respiratory problems like asthma and cancer. This can be especially harmful to children and elders. As a result, people may miss more days at school and work, and at its worst, they die earlier than those who live in other communities. • Climate change is increasing both the frequency and severity of storms. This can be particularly tough on low-income households and communities of color who may have harder times finding alternative locations to flee storms, difficulty in having transportation to evacuate, less of a financial cushion if their paycheck or income is disrupted, etc. • Increasing temperatures and numbers of "high heat" days pose special difficulties for communities of color, the elderly and lower-income households. These groups are already spending upwards of 40% of their income on utilities now. As bills escalate, people are forced to turn off their A/C to save money. And they may have no	

environmental laws, regulations, and policies. Environmental justice is about equal access to and enjoyment of the world's beauty and resources. It is about preservation of lifeways which are dependent upon natural resources and certain environmental and climactic conditions. It involves free, informed and prior consent for communities related to resource rights and any proposed development or extraction processes affecting them. It is about the right for individuals and communities to be safe and healthy. It is a commitment to future generations that they will inherit a world which is at least as safe, healthy, and beautiful as the one we inherited. And finally, at the heart of our approach to environmental justice work is the ethic of including the community in every step of public processes to make their environment safe and their area a healthy place to live. ***NNACP. P 11***		women, etc. have less advantages and access to resources in our society than other people. In the context of climate change, frontline communities' health, income, and access to resources is less than people who have social privilege (people who are white, upper middle-class or upper-class, able-bodied, in middle age ranges, heterosexual, non- trans, etc.). In other words, people who experience oppression because of race, income, gender, sexual orientation, disability, gender identity, age, etc. are more likely to have less resources and protections in our society in general and even less access to resources and protections not only to adapt to our changing climate but also to pass policies and legislation that are fair and culturally significant. ***NAACP. P 12***	money to fix their A/C when it breaks, as units often do under extreme heat waves. If there are no cooling centers or other options available, they are left at home and susceptible to heat- related illness and death. • Research has documented the link between where people of color live and where hazardous waste facilities and coal-fired power plants are located – the institutional racism in land use policy, industrial zoning and siting, and housing policies. This means that when storm winds or surges batter these facilities, they may cause toxic releases into the air, water, and soil, and structures (homes, schools, etc.) in the neighborhoods around them. This can exacerbate the health challenges these toxics have already been causing the community, and further depress home prices/property values, diminishing the financial resources of residents. • Emergency planners often do not consider communities of color, low-income communities, nursing home facilities, people with disabilities, women, and LGBTQ people when they plan emergency transportation needs, evacuation routes, shelter needs, food and clean water access, utility shut-offs and reconnection processes, medical needs, etc. When they make plans, they do not organize educational programs that reach these communities as well as rural communities in disaster preparedness. • People who are undocumented and/or people whose first language is not English do not receive the same resources during natural disasters caused by climate change. Often, these individuals do not seek government resources for the fear being deported, which does happen in some cases, and because of prejudice and bias in emergency responders. There are not resources like pamphlets or community education programs created in their language or with their culturally specific needs in mind. • Women of color and children are at higher risk for sexual assault when placed in emergency shelters, emergency housing, or when they are forced to live with family members or partners who may be their abuser or perpetrator. • Many LGBTQ individuals of color and particularly transgender people of color are subject to discriminatory housing practices (that are legal in most states) that force them into lower priced and lower quality homes, and as mentioned previously, these homes are located closer to or next to dirty energy plants and other "undesirable" properties. Additionally, their needs, particularly those in the transgender community, are not considered when emergency planners consider shelter needs. In fact, many shelters refuse to take in transgender or gender non-conforming people. ***NAACP pp 13***	
Public Health	Weather	Adaptive capacity		GI and Health

COVID -19 https://www.wuwm.com/term/coronavirus?utm_source=ActiveCampaign&utm_medium=email&utm_content=Coronavirus%3A+How+It+s+Impacting+Wisconsin&utm_campaign=20200313-REWIND#stream/0 **In Milwaukee, Wisconsin, 59,815 people don't** have a park within a 10 minute walk of home which means they are at increased risk of stress, depression, and poor mental health outcomes. they are at increased risk of heart disease, diabetes, and other conditions related to inactivity. they are more vulnerable to heat waves, flooding, and other extreme weather events. Trust for Public Lands https://www.tpl.org/10-minute-walk-donor-welcome-page?utm_source=10MW_landing&utm_medium=email&utm_campaign=1x_donor_engagement	extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	curtailed/disease/ pest vectors We also need health action for climate. This means a coordinated public campaign to provide Californians with the information they need to protect against climate health harms. Health care facilities need guidance and support to implement practices that reduce climate pollution and ensure the ability to function during climate-related disasters. And local health departments need increased workforce capacity and resources to protect public health in the era of climate change. Climate and health action will be most effective when those most impacted have the voice, power and capacity to be full partners in building a healthy and climate-resilient future, with		https://drive.google.com/drive/u/0/shared-with-me Food security: https://urbanmilwaukee.com/2017/10/31/proposal-would-grow-central-city-farms/ Food System circularity: https://www.ellenmacarthurfoundation.org/assets/downloads/CCEFF_Full-report-pages_May-2019_Web.pdf

		meaningful roles and power in decision-making processes. -*Resilience Matters 2020 p 14*		
Public Safety	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Ability of responders		
Vulnerable Populations:	EXPOSURE *What climate change effects will a community experience?*	SENSITVITY *What aspects (people, structures, functions) of a community will be affected?*	POTENTIAL IMPACTS *How will climate change affect the points of sensitivity?*	ADAPTAIVE CAPACITY *What is currently being done to address the impacts*
Medical Conditions, "But climate change threatens to undermine even the best efforts to achieve health for all. Climate change is a health emergency. It's impacting our health now and acts as a threat multiplier to exacerbate the state's many social and health equity challenges." ***RM p. 13***	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect / air quality	Increase of health crises/ decrease in care facilities functionality		
Linguistic	Weather	Disruption of		

isolation,	extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	translation services/ communication lines		
Residential location,	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Heat island/ flooding		
Work Location,	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Transit disruptions		
Poverty	Weather extremes/duration/	Disruption of service/support		

	frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	systems, NGO and Government		
Population Increase	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Stress on housing availability/possible social rejection		
Economic Systems **Climate Justice and Civil Rights** The NAACP believes that equity in climate change adaptation is a civil and human right that belongs to everyone. Everyone has a right to live in a world that is free from the impacts of climate change we deserve the same resources for climate adaptation planning as other communities. Unfortunately, energy companies, the energy industry, corporations, some politicians and lawmakers, and others who pollute our air, water, and soil do not operate under this principle. The way they do business not only impacts the environment but the people who live in it, which results in health problems and other issues for our communities. This also is an issue of morality and fairness in that the people who have least benefited from the economic system which created climate change – in the US and around the world – are the ones who are disproportionately bearing the burdens of the negative	EXPOSURE *What climate change effects will a community experience?*	SENSITVITY *What aspects (people, structures, functions) of a community will be affected?* 5.1.3 Explaining the source of economic resilience The Brookings Institution (Berube, et al., 2010) provides some indication of why there has been differential performance (over and above the clearly significant effects of national differences). Industry specialization and differences in human capital stock were among the key	POTENTIAL IMPACTS *How will climate change affect the points of sensitivity?*	ADAPTAIVE CAPACITY *What is currently being done to address the impacts* *Cool Choices: Simulation Game for Business ECO focus* https://1c0efdcd-96c2-47b0-bb81-6ab40b41afea.filesusr.com/ugd/90769c_9dfda6f3a8df4e22af0b6a565bbb3c94.pdf Wisconsin Sustainability Council https://directories.onepercentfortheplanet.org/nonprofit-partners/wsbc-wisconsin-sustainable-business-council Epidemic support https://www.epi.org/blog/the-coronavirus-pandemic-requires-

consequences. ***NAACP p 17***		factors identified. Brookings concluded that: Cities with the construction industry as a significant segment of their economy performed poorly during and immediately after the recession (not surprising given the sensitivity of property and construction to economic change); Cities (excluding those in East Asia) dependent on export oriented manufacturing struggled to bounce-back after the recession; In some global regions cities with a large financial sector component were adversely affected; and, *Cities with non-market services as a significant component of the economy (government, education, health etc.) tended to weather the storm better.* ***URM***		state-and-local-policymakers-to-act-in-addition-to-demanding-a-strong-federal-response/?utm_source=Economic+Policy+Institute&utm_campaign=9000ab1320-EMAIL_CAMPAIGN_2019_02_22_11_12_COPY_01&utm_medium=email&utm_term=0_e7c5826c50-9000ab1320-58436993&mc_cid=9000ab1320&mc_eid=0553f3ca92
Economic health	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Need to rebuild, repair or retreat		Business support crisis: https://connxus.com/coronavirus-covid-19-resources-for-businesses/

Import/Export of goods	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Disruption of transfer of goods for production and consumption		
Employment level and security	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Goods and services supply disruption creates disruption of employment/security		
Flexibility	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Response to increasing variables depletes resources: physical, monetary, social		Public Banking: https://www.publicbankinginstitute.org/2020/04/08/pbis-open-letter-to-congress-a-critical-care-bailout-for-main-street-in-the-face-of-covid-19/

Ecosystem Health	EXPOSURE *What climate change effects will a community experience?*	SENSITVITY *What aspects (people, structures, functions) of a community will be affected?*	POTENTIAL IMPACTS *How will climate change affect the points of sensitivity?*	ADAPTAIVE CAPACITY *What is currently being done to address the impacts*
Terrestrial ecosystems	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Physical destruction and disruption of ecosystem services		
Freshwater ecosystems	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect https://urbanmilwaukee.com/2020/02/22/lake-michigan-at-record-water-levels/#comment-1567618	Increased pollution and disruption of ecosystem cycles that support life First, we need to acknowledge the connection between the natural environment and vulnerability to terrorism by integrating sustainability principles and practices into the National Homeland Security Strategy. The U.S. military recognizes that global competition for finite natural resources is a national security concern and has embraced sustainability as a vital strategic security element and mission enabler.		https://urbanmilwaukee.com/pressrelease/evers-effect-pushes-assembly-passage-of-water-quality-bills/ Alliance for Great Lakes 10 proposals: https://greatlakes.org/2020/02/blog-federal-priorities-2020/ https://greatlakes.org/wp-content/uploads/2020/02/FED-priorities-2020.pdf

		Second, governments and utilities must fund investments in smaller scale, distributed infrastructure systems. Centralized utilities with large, complex distribution systems are more vulnerable to targeted disruptions with consequences of failure spread across a larger population. Distributed power systems, such as on-site photovoltaics or micro-grid generation, reduce the risk of widespread power failures as well as the cascading effects and economic damage that result. *Resilience Matters Mazur et al. p 23*		
Coastal environments	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect In addition to suffering damages from storms and gradual inundation by rising seas, coastal ecosystems may fall victim to human efforts to protect communities and infrastructure from	Destruction of human and natural edges		

	these risks. Built structures such as seawalls, damage beach systems and can prevent healthy functioning of marshes and wetlands. Living shorelines, which use natural materials such as plants, sand, or rock to stabilize the shoreline, are an improvement over conventional concrete seawalls but can have some of the same damaging impacts. Beach restoration projects can also harm the ecosystem of the beach as well as the sites from which sand is taken. Still another manmade threat is the failure to provide space for coastal ecosystems to migrate landward as seas rise. As the inevitability of stepping back from the current coastline is better recognized, land areas that are safe from storms and rising seas will be committed to meet human needs. Ecosystems could lose out on this valuable space. *Resilience Matters p 26*			
Urban Agriculture	Weather extremes/duration/ frequency/No	Disruption of season cycles for pollination/ bloom times/ heat,		MMSD Biodiversity: Urban agriculture is an activity strongly related to GI that also has the potential to improve—and benefit from—

	Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	water scarcity or overabundance		regional biodiversity. The U.S. Department of Agriculture defines urban agriculture as "backyard, roof-top and balcony gardening, community gardening in vacant lots and parks, roadside urban fringe agriculture and livestock grazing in open space." The Milwaukee region is a national leader in urban agriculture through the efforts of Growing Power, the Urban Ecology Center, and University of Wisconsin – Extension, among others. Urban agriculture has a potentially very significant role in not only helping with stormwater management but also ensuring healthy cities. Urban farms and gardens can improve the visual quality of neighborhoods; connect urban residents to food systems; improve access to fresh, nutritious food; help in combating childhood obesity, diabetes, and poor nutrition; provide access to rare foods that support the cultural heritage of citizens; offer opportunities for recreation and relaxation when gardening outdoors; improve the food security of households; and help gardeners and urban farmers gain new knowledge and technical skills (Freshwater Society, 2013). Urban agriculture, GI, and urban biodiversity complement each other in many ways, including the following: • Water collected from rainwater harvesting can be used to support urban agriculture activities, whether rain barrels that support small raised planter beds or large cisterns that support larger operations. • "Depaving" a site to create a city garden will reduce stormwater runoff in the same way that GI does (e.g.,

				imperviousness will be reduced and soil infiltration and plant evapotranspiration will increase). • Biodiversity and agriculture are inextricably linked. Protecting and promoting biodiversity in our existing agricultural systems (including both wild and cultivated species) is key to making food systems more adaptable and resilient, and to safeguarding the ecosystem services we depend on in the face of global climate change. This plan recommends that stakeholders include community garden plots, larger urban vegetable farms, and perennial food forest parks along with GI when considering how to best optimize urban biodiversity in the region. P 42
Peri-urban Agriculture	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to 2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Disruption of season cycles for pollination/ bloom times/ heat, water scarcity or overabundance/ Transport disruption		Public banking: https://www.youtube.com/watch?v=z8P7tnC4w0s&feature=youtu.be&mc_cid=58d1fd57cc&mc_eid=4984cc9a10 https://www.youtube.com/watch?v=gliik0ve8eg&feature=youtu.be&mc_cid=58d1fd57cc&mc_eid=4984cc9a10
Rural Agriculture ***Panel 5:*** **The future of food in the face of climate change** Most studies investigating the effect of climate change on food production indicate an aggregate reduction in future agricultural productivity, particularly in low-latitude regions.*A24–A27* Knox and	Weather extremes/duration/ frequency/No Model to predict 2030 to 2050 to	Disruption of season cycles for pollination/ bloom times/ heat, water scarcity or overabundance		

colleagues*A24* project an 8% reduction in mean yield of all crops by 2050 across Africa and south Asia. For major crops (wheat, rice, and maize) in tropical and temperate regions, local temperature increases of 2°C or more without adaptation will negatively affect production. However, substantial variability exists between regions, crops, and adaptation scenarios. About 10% of projections for 2030–49 show more than 10% increase in food production, whereas about 10% of projections show more than 25% decrease,*A25* with risks of more severe effects increasing after 2050. Climate change will also affect fisheries and aquaculture.*A28–A30* Increased productivity is estimated at high latitudes and decreased productivity at low and mid latitudes, with considerable regional variation. For example, poleward migration of fish alone has been estimated to reduce maximum catch potential in some tropical areas by up to 40%.*A31* However, deviation from current yields rarely exceeds 10%.*A32* The effects of climate change on agriculture are expected to substantially impact human health. Reductions in agricultural production due to climate change have been estimated to cause 500 000 climate-related deaths in 2050, most of which are due to reduced fruit and vegetable production and consumption, followed by increases in underweight from reduced availability of food.*A33* In addition, nutritional quality of food and fodder is predicted to decrease because of elevated carbon dioxide concentrations.*A25* For example, grains and legumes contain lower concentrations of iron and zinc when grown at elevated carbon dioxide concentrations that are predicted for mid-century than do grains and legumes grown at current carbon dioxide concentrations.*A34* At elevated carbon dioxide concentrations, protein and amino acid concentrations decrease in spring wheat (a major staple crop), whereas non-structural carbohydrates (except starch) and lipids significantly increases.*A35* Crop diversity might be a solution to decreasing yields and nutritional quality caused by climate change. A report by the Food and Agriculture Organization places crop diversity at the forefront of adaptation solutions.*A36* New and improved crop varieties are needed that can withstand challenges that climate change will pose to global food security. Developing crop varieties that can withstand heat, drought, flood, and other extreme weather events might be the most important step to adapt to climate change. References cited in this panel can be	2100/ best case - worst case? Rapidity and place of change Air Pollution Heat Island effect	Transport disruption		

found in the appendix (pp 27–28). https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(18)31788-4.pdf?utm_campaign=tleat19&utm_source=HubPage				
RESOURCE LINKS **NAACP: Assessing Equity and Resilience in Climate Adaptation Plans** The sections below highlight sample indicators and metrics that can be used to assess and build equity into Climate Adaptation Planning at various scales. Communities may find this tool useful for assessing equity in existing climate adaptation plans or to guide the development of new plans. Either way, the purpose of this tool is to deepen work around incorporating intersectionality in equitable adaptation planning. Keep in mind that some indicators of pre- existing vulnerabilities/risk factors cannot be changed (ex. age, gender, race, pre-existing health conditions, etc.). With that said, it is still important that these characteristics be factored into adaptation planning, and may indicate a need for a different or adapted planning that accommodates various pre-existing vulnerabilities. Conversely, some of the pre-existing vulnerabilities (income/wealth, employment, literacy, education, housing stock, insurance status, etc.) can and should be changed to create more resilient and equitable communities. Pp: 106-148	MMSD Biodiversity **https://www.freshcoastguardians.com/resources/our-plans** ICLEI AFRICA ***IAF*** https://africa.iclei.org/wp-content/uploads/2020/03/2020_Publication_WIOMSA_Adapting-to-climate-change-and-enhancing-resilience-training-manual_English.pdf 100 Resilient Cities Sandia https://www.sandia.gov/cities/index.html Urban Resilience for Municipalities https://www.academia.edu/10862964/Urban_Resilience_Thinking_for_Municipalities?email_work_card=view-paper ***URM*** Resilience Matters Mazur, et al https://issuu.com/islandpress/docs/resilience_matters_action_in_an_age_of_uncertainty ***RM*** Environmental Law and Policy Center			EPA Climate Change Adaptation Resource Center https://www.epa.gov/arc-x Wisconsin Imitative On Climate Change Impacts http://www.wicci.wisc.edu National Climate assessment https://www.globalchange.gov/nca4 MMSD Resilience Plan 2019 https://www.mmsd.com/application/files/7015/6719/9307/Resilience_Plan_2019_FINALv2.pdf https://www.moveforwardmke.com/resources

	http://elpc.org/wp-content/uploads/2019/03/Great-Lakes-Climate-Change-Report.pdf			
Liberation Even as we strive to incorporate principles of equity and resilience into every aspect of community-driven climate resilience planning, we must remain grounded in our ultimate goal of freedom and collective	liberation. We are fighting for a world where we are *all* free from *all* forms of oppression and exploitation. This liberatory vision is free from the confines of existing models or systems, including limits on thought or	behavior. In other words, our liberation is not contained to improving the systems and conditions that we have today. The collective liberation of our people and ecosystems requires transformative action. When we liberate our spirits and allow our imaginations to run free we	allow ourselves to articulate a bold vision for a future worth working for. ***NAACP p 20***	"Our work must be organized through democratic and voluntary cooperation, rather than coercion and exploitation. When we freely apply our labor together to solve our problems and meet our needs, we will both liberate the soil from the physical concrete that paves over life and liberate our spirits from the cognitive concrete that has paved over our imaginations." ***NAACP. P 20***