CENTERING RACIAL JUSTICE IN URBAN FLOOD ADAPTATION

PLANNING AND EVALUATION TOOLS FOR GREAT LAKES CITIES

UNIVERSITY OF MICHIGAN

CONTENTS

AUTHORS

Sara Hughes, *University of Michigan*

Kirsten Schwarz, *University of California, Los Angeles*

Joyce Coffee, *Resilience Consulting*

Genevieve LaMarr LeMee, *University of Michigan*

Sarah Dobie, *University of Michigan*

Madeleine Lane, *University of Michigan*

Andres Gonzalez, *University of California, Los Angeles*

ACKNOWLEDGED PARTNERS

Kelly Turner, *University of California, Los Angeles*

Richard Norton, *University of Michigan*

Kristin Baja, *Urban Sustainability Directors Network*

Joel Howrani-Heeres, *City of Detroit*

Missy Stults, *City of Ann Arbor*

Matthew Naud, *Great Lakes Integrated Sciences and Assessments*

Cover: *Detroit skyline. Photo by Rikin Katyal on Unsplash*
Inside cover: *Looking upstream on the Grand River in downtown Grand Rapids. Photo courtesy of National Weather Service.*

DEFINITION OF TERMS USED IN THIS REPORT

Climate Change Adaptation is the adjustment to current climate conditions or expected climate changes and their impacts.

Economic Equity is realized when all persons, including economically disadvantaged people and communities, have "full and fair" access to jobs, opportunities, services, housing, and public transportation (Race Forward: Yen Liu & Keleher, 2009).

Equity is a just and fair distribution of resources and opportunities informed by how structural, institutional, and systemic practices have disadvantaged some populations and privileged others. Resources are distributed based on need (which differs from equity, which focuses on sameness).

Gender Equity is realized when one's gender identity does not predict one's access, opportunities, or outcomes. Benefits and burdens are equally shared.

Racial Equity is realized "when race can no longer be used to predict life outcomes and outcomes for all groups are improved" (GARE, 2017).

Racial Justice refers to the work of dismantling systems that have historically oppressed marginalized persons. It is the "proactive reinforcement of policies, practices, attitudes and actions that produce equitable power, access, opportunities, treatment, impacts and outcomes for all" (ICMA, 2021). Racial justice leads to the actualization of racial equity.

(Urban) Resilience is "the ability of people and their communities to anticipate, accommodate, and positively adapt to or thrive amidst changing climate conditions and hazard events" (USDN 2019).

Risk is the combined likelihood of an event occurring and its impact.

Stormwater Infrastructure can take the form of grey infrastructure or green infrastructure with both seeking to reduce localized flooding. Grey infrastructure, or traditional stormwater infrastructure, moves water away from the built environment through either a separate or combined sewer system traveling to a local water body or water treatment plant. Green infrastructure seeks to mimic the natural by capturing and infiltrating precipitation.

Targeted Universalism involves setting universal goals, assessing how population subgroups fare relative to the goals, and addressing barriers, structural impediments, and resource deficiencies in a targeted manner in order for all groups to meet goals (Michigan Department of Civil Rights and Gerald R. Ford School of Public Policy, 2018).

Urban Flooding occurs when overburdened sewer systems and impervious surfaces are unable to adequately drain precipitation in the form of rainfall and snowmelt, leading to the inundation of homes, streets, and other parts of the built environment and, in some cases, sewer backups.

Vulnerability indicates the degree to which a person or community is at risk, risk being the likelihood of a threat and impact. Impact is determined by the nature and magnitude of the exposure, sensitivity to the exposure, and the capacity of an individual or community to adapt and respond (Public Health Institute and American Public Health Association: Rudolph et al., 2018).

PART 1

MOTIVATION FOR THE REPORT AND BACKGROUND ON THE GREAT LAKES CONTEXT

Great Lakes cities face the simultaneous and intertwined challenges of climate change adaptation and racial inequality. Decision makers, planners, advocates, and residents in the region increasingly recognize the need to respond to these challenges and are taking steps to do so. This report aims to serve as a guide and resource for local policies, programs, investments, and advocacy that can help prepare our region for climate change and strengthen our communities.

This report provides a set of five principles for centering racial justice in adaptation planning and policy, focusing specifically on how these apply to efforts to adapt to increasing flood risk due to storms and heavy rain events. We provide examples and highlight useful cases throughout the report to illustrate these principles in action. We also provide examples of planning tools and resources that are already available and that can support efforts to center racial justice in local climate adaptation planning. We identify ways that program and policy evaluation will also need to shift in support of racial justice by integrating racial justice into the evaluation process.

RACE AND INEQUALITY IN GREAT LAKES CITIES

Racial segregation and inequality have always characterized Great Lakes cities but have been exacerbated by the deindustrialization, population loss, and disinvestment of the last 50 years. The Great Migration of the early 20th century saw more than 6 million African Americans move from the southern U.S. to the north and west. The Great Lakes region in particular presented opportunities for employment as the region's industrial strength grew. However, the promise of the region for African Americans did not always include integrated housing and schools, or equitable access to well-paying jobs (Highsmith, 2015). Many cities in the region that were once industrial powerhouses have seen a sustained loss of jobs and residents (particularly white residents) as political and economic patterns have shifted. Today, racial segregation and inequality are pressing problems for Great Lakes cities, with 15 of the 25 most segregated U.S. cities located in the region (U.S. Water Alliance, 2018).

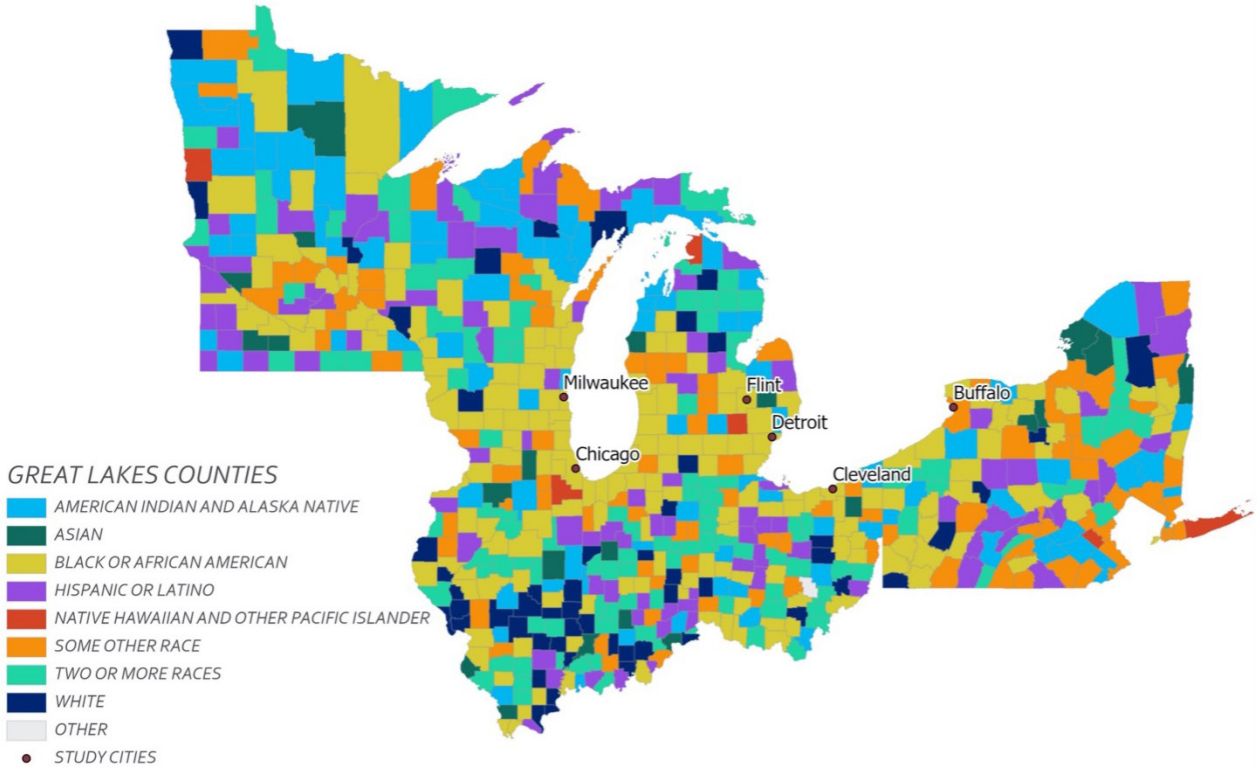
The social and economic consequences of racial segregation and inequality of Great Lakes cities are now readily apparent (MPC, 2017). Black, Indigenous, and people of color (BIPOC) in the region have lower median household incomes and face higher unemployment rates (Table 1). Black households have the lowest median household income (MHI) in all Great Lakes states except New York and Pennsylvania. In these states Black household incomes are markedly lower than the median, and in some cases around half of the median household income for the state. After "some other race", Black households had the lowest median income in Pennsylvania at $38,560. In Minnesota, Wisconsin, Michigan, and Ohio, American Indian and Alaska Native households had the lowest median income after Black households.

Table 1. Median Household Incomes (MHI) in the Great Lakes States

State	Racial Group with Lowest MHI	MHI for Lowest Earning Group	MHI for the State
Minnesota	Black	$37,811	$71,306
Wisconsin	Black	$31,351	$61,747
Illinois	Black	$38,573	$65,886
Indiana	Black	$34,895	$56,303
Ohio	Black	$33,158	$56,602
Michigan	Black	$35,322	$57,144
Pennsylvania	Some other race	$36,566	$61,744
New York	American Indian or Alaska Native	$41,509	$68,486

Note. Adapted from Urban Observatory by Esri. (2018). *Race/ethnicity with lowest median income* [map]. Retrieved from https://racialequity.maps.arcgis.com/home/item.html?id=0ed46c1e58034bf583e7afc99fcd6a5c

Figure 1: Racial Group with Lowest Household Income in Great Lakes Counties



Racial disparities in income are also present in the major urban counties of the region (Figure 1). In Milwaukee County, Cook County (Chicago), Genesee County (Flint), Wayne County (Detroit), and Cuyahoga County (Cleveland), Black households have the lowest median income; in Erie County (Buffalo), some other race has the lowest median household income followed by American Indian or Alaska Native households.

Unemployment rates are persistently higher for Black residents of the Great Lakes and support the above findings that Black Americans have lower median household incomes than other racial groups in most Great Lakes states. For example, Illinois has the highest Black unemployment rate in the country, sitting at more than double the state's white unemployment rate (Table 2; U.S. Water Alliance, 2018).

These disparities are generated and maintained by current and historic policies and oppressive systems that uphold the racial wealth gap and preclude BIPOC communities from gaining access to employment and living wage jobs. Past federal, state, and local policies, particularly racist housing policies, wage and land theft, are responsible for African American and Indigenous populations especially lacking access to generational or community wealth (Lui et al. 2006; Johnson, Melissa et al., 2019).

Table 2. Racial Disparities in Unemployment in the Great Lakes

State	Black Unemployment Rate	Black-White Unemployment Rate Ratio
Illinois	8.8%	2.6
Indiana	7.5%	2.5
Ohio	6.9%	1.6
Michigan	6.6%	1.9
Pennsylvania	8.9%	2.6
New York	6.6%	2.0

Note. Minnesota and Wisconsin sample sizes were too low to create accurate estimates. Adapted from "Black unemployment is at least twice as high as white unemployment at the national level and in 14 states and the District of Columbia" by V. Wilson, 2019, Economic Policy Institute. Copyright 2020 by Economic Policy Institute. https://www.epi.org/publication/valerie-figures-state-unemployment-by-race/

Housing policies have generated segregated neighborhoods, and BIPOC communities often reside in flood-prone areas of cities. The impacts of flooding tend to be more severe for BIPOC communities as they are often compounded by inadequate infrastructure, additional environmental hazards, lower quality housing, limited flood and health insurance, and lost wages. In many instances, historical housing policies and development practices have concentrated vulnerable populations—specifically BIPOC and low-income populations—in flood prone areas (U.S. Water Alliance, 2020) and contemporary housing and insurance programs can redistribute flood risks to these areas to protect white, high-income communities. Urban drainage systems may reroute storm water to areas inhabited by socially vulnerable populations (La Rosa & Pappalardo, 2020). BIPOC communities are less likely to have flood or health insurance, and low-income households have limited financial resources to repair or rebuild after a flood. These limitations may trap residents in unhealthy homes or displace them to a neighborhood with lower housing costs but even more exposure to environmental hazards. Disproportionate flood risk is particularly concerning given that many people of color lack health insurance to treat any illnesses which may arise from flood exposure and its associated impacts. People of color already tend to carry a heavier burden of disease including elevated stress levels. Health impacts from urban flooding compound these previous and underlying health conditions and exposures. Georges Benjamin, Executive Director of the American Public Health Association, argues that "like health inequities, climate change, is a problem rooted in the structures, systems, and values of our society and economy. Eliminating health inequities and resolving climate change requires an intersectoral and transformational approach."

As our cities age, it is increasingly apparent that there are racial disparities in the quality and longevity of critical infrastructures and that many cities lack the capacity to rectify the consequences of previous underinvestment in BIPOC communities. In a study of stormwater management in the City of Detroit, scholars found that:

> "Because of a lack of funding, the City of Detroit has been unable to routinely clean its 95,000 catch basins since 2010; where basins are blocked, streets flood...The city reports that 75% of the drains citywide are covered by debris or have a blockage. While Detroit's problems are severe, they are mirrored on a lesser scale by similar problems in other communities" *(University of Maryland 2018, 23).*

These disparities in infrastructure investment and performance, particularly in stormwater systems, leave BIPOC communities vulnerable to the economic and health consequences of flooding and storm damage. During heavy rain events, inadequately maintained

infrastructure increases the risk of flooding, especially in cities with combined sewer systems. In Illinois and Michigan, the most expensive flood damage has occurred in Chicago and Detroit, two racially segregated cities with large Black populations. A survey of Detroit residents conducted in 2018 found that low-income households had significantly higher rates of flooding or standing water in basements, to have been sick from these experiences, and to have had to spend money addressing flooding issues in their homes (Detroit Metro Area Communities Study 2018).

Other environmental hazards such as brownfields or contaminated soil, industrial and manufacturing operations, and trucking routes also tend to be located in or run through low-income communities or BIPOC communities and increase the risks associated with flood events. Stormwater runoff will pick up and carry these pollutants, which can also pool if they are unable to infiltrate into the ground or pass through storm drains. The waste materials from combined sewer backups can also pool in streets or homes, exposing residents to pathogens and pollutants. Water is more likely to pool in BIPOC communities, especially low-income, as they often lack the pervious surfaces and green infrastructure that can prevent or reduce flooding. Between January 2010 to August 2019, 20% of flood claims to FEMA's National Flood Insurance Program originated from zip codes where at least a quarter of residents were Black, while only 12.8% of the U.S. population is Black (U.S. Census Bureau, 2019; Frank, 2020).

Using disaggregated flood risk information from the First Street Foundation we examine the intersection of flood risk and race in six Great Lakes cities: Buffalo, Chicago, Cleveland, Detroit, Flint, and Milwaukee (Figures 2-7). In all cities current and future flood risk is unevenly distributed, and the maps reveal areas with high potential for investment and policy to address both racial inequality and flood risk and adaptation needs. These are high priority areas for investment and intervention to tackle racial justice and urban flooding.

Figure 2: Intersectional Opportunities in the Buffalo Metropolitan Area

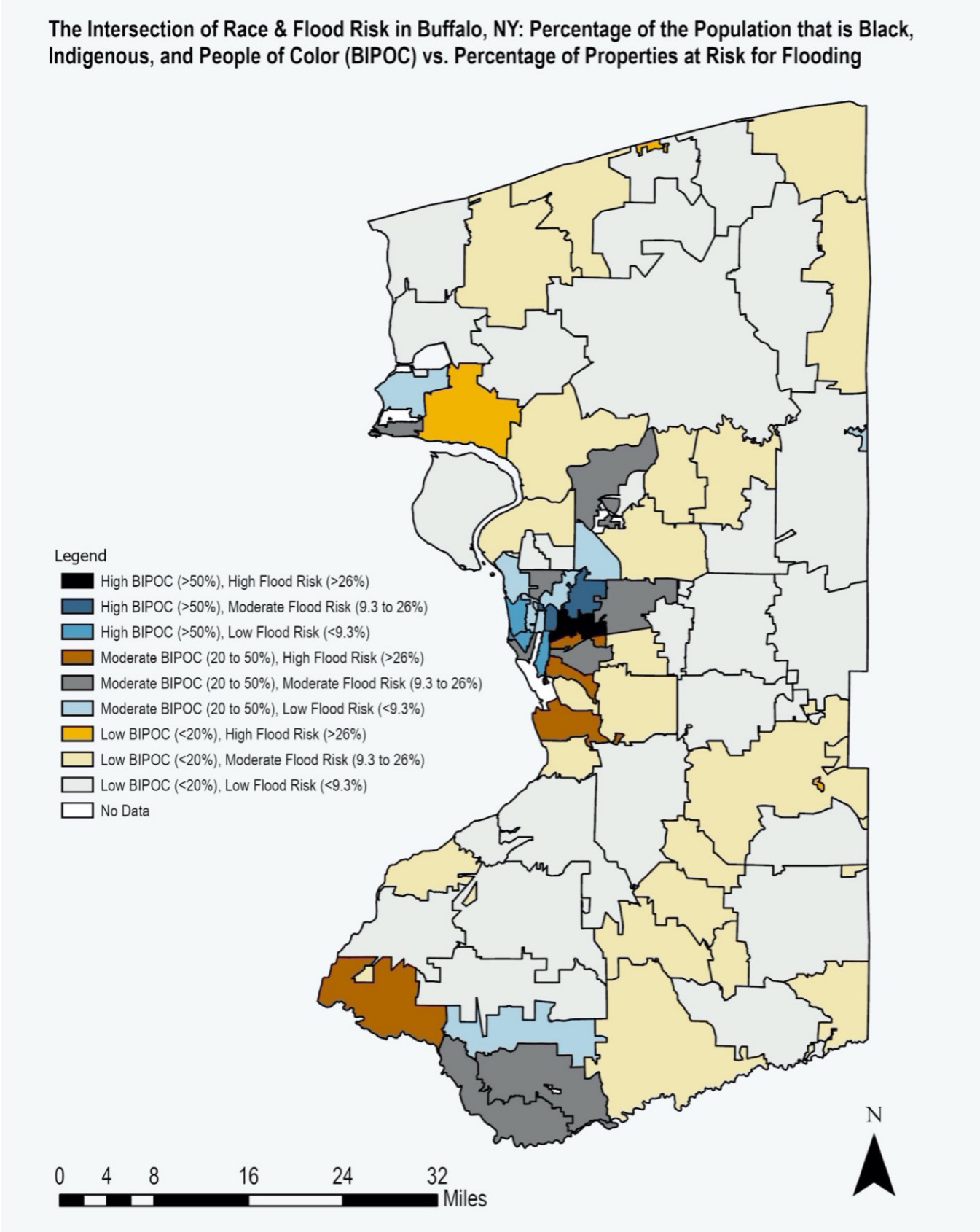


Figure 3: Intersectional Opportunities in the Chicago Metropolitan Area

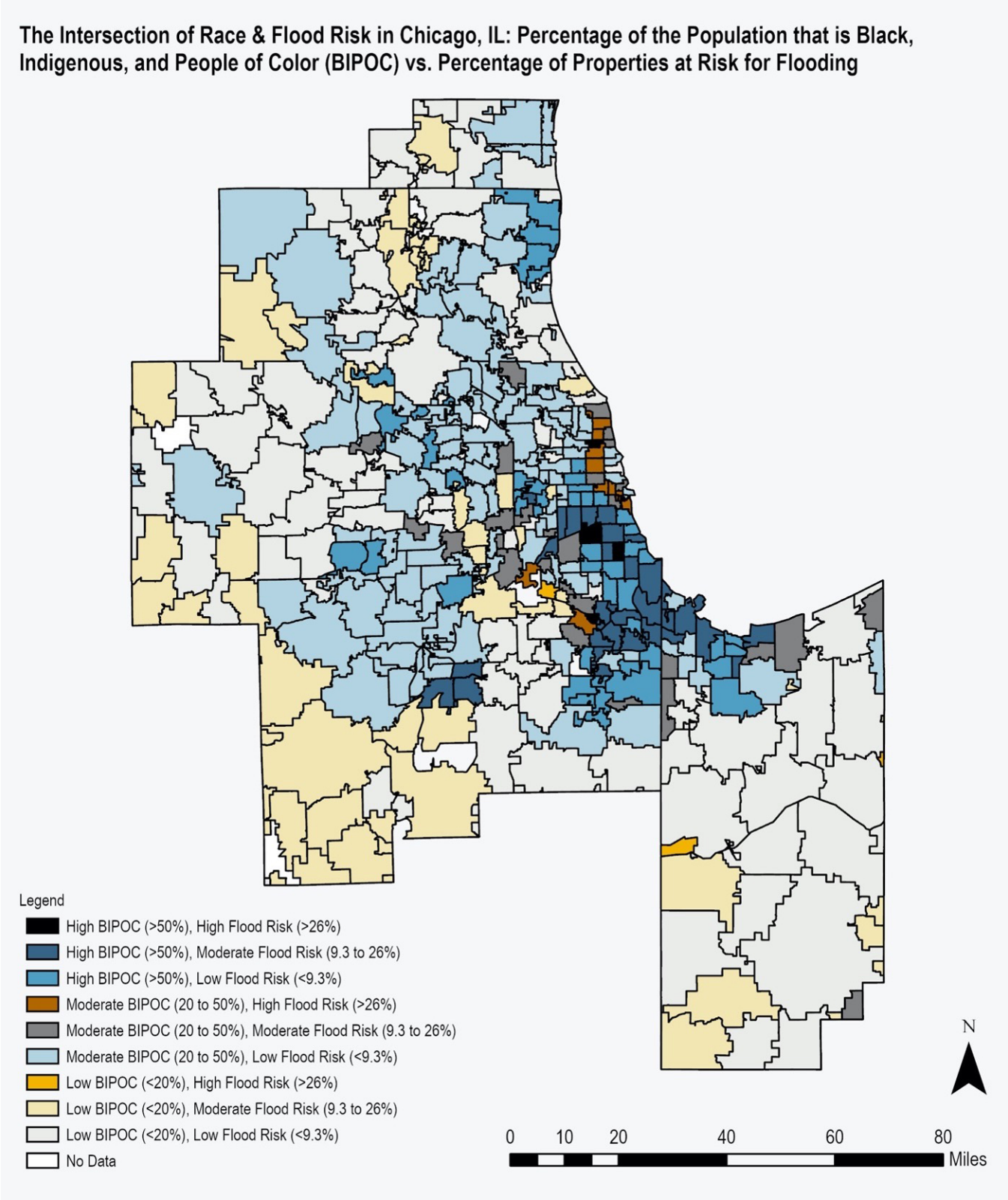


Figure 4: Intersectional Opportunities in the Cleveland Metropolitan Area

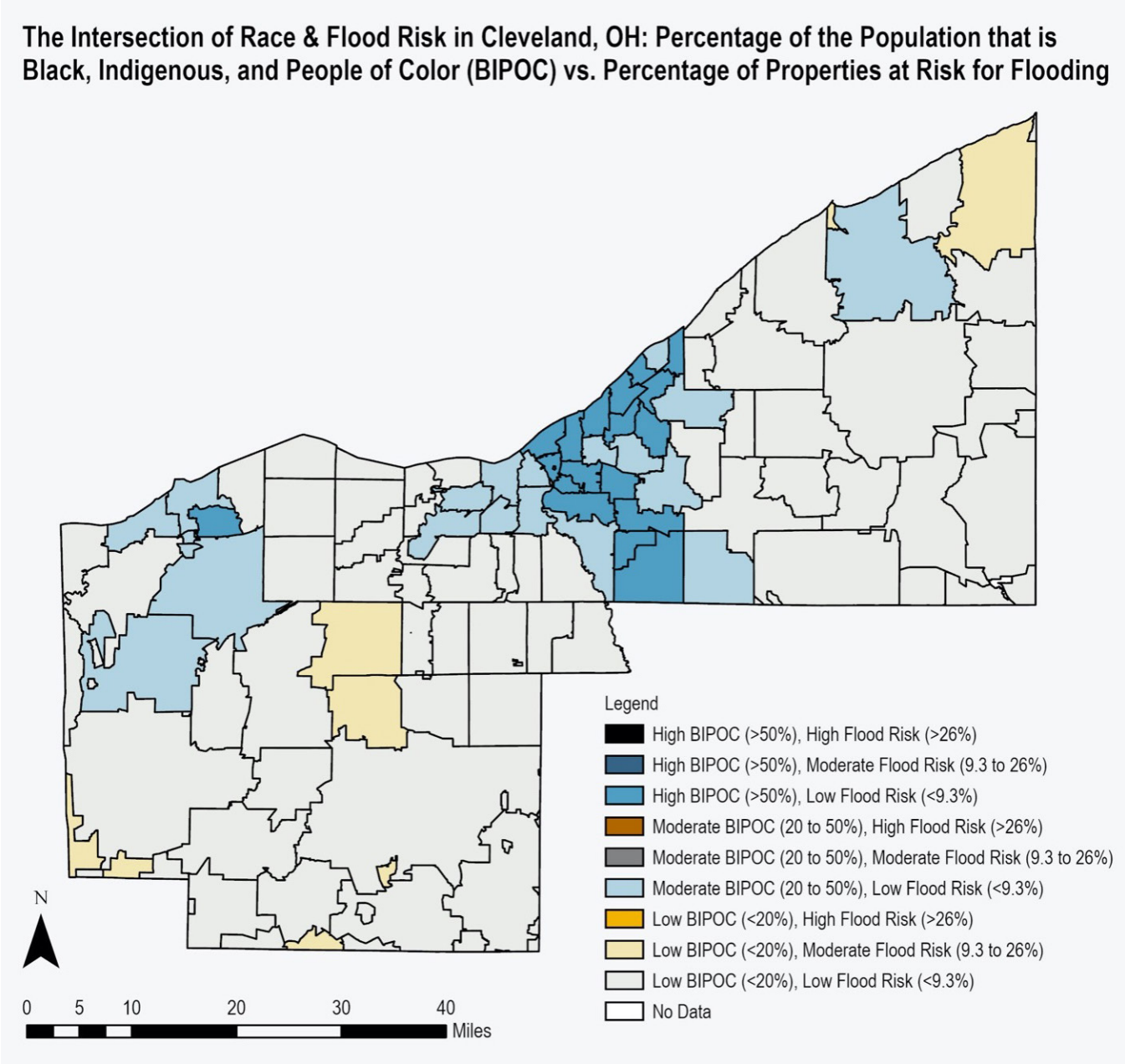


Figure 5: Intersectional Opportunities in the Detroit Metropolitan Area

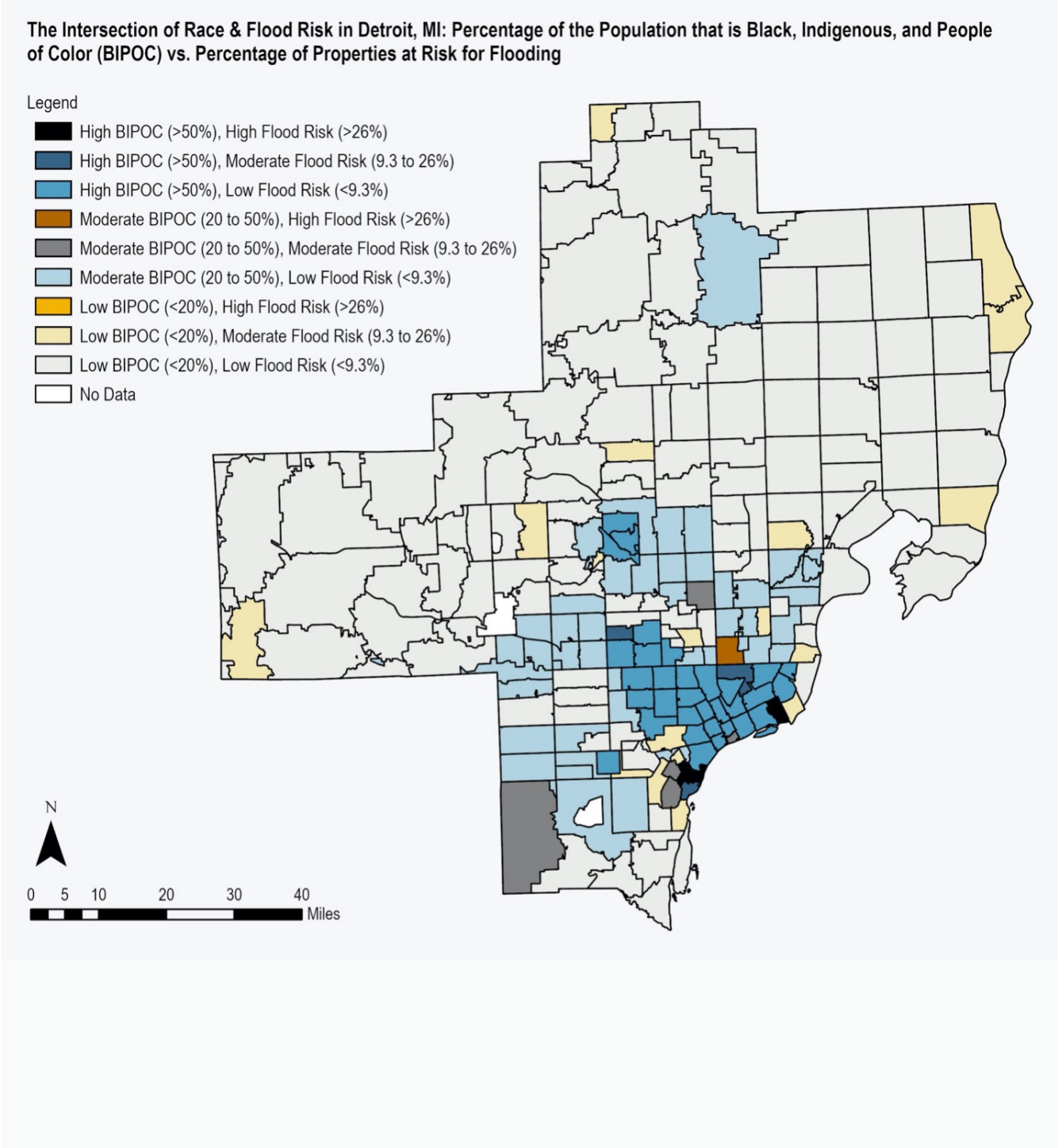


Figure 6: Intersectional Opportunities in the Flint Metropolitan Area

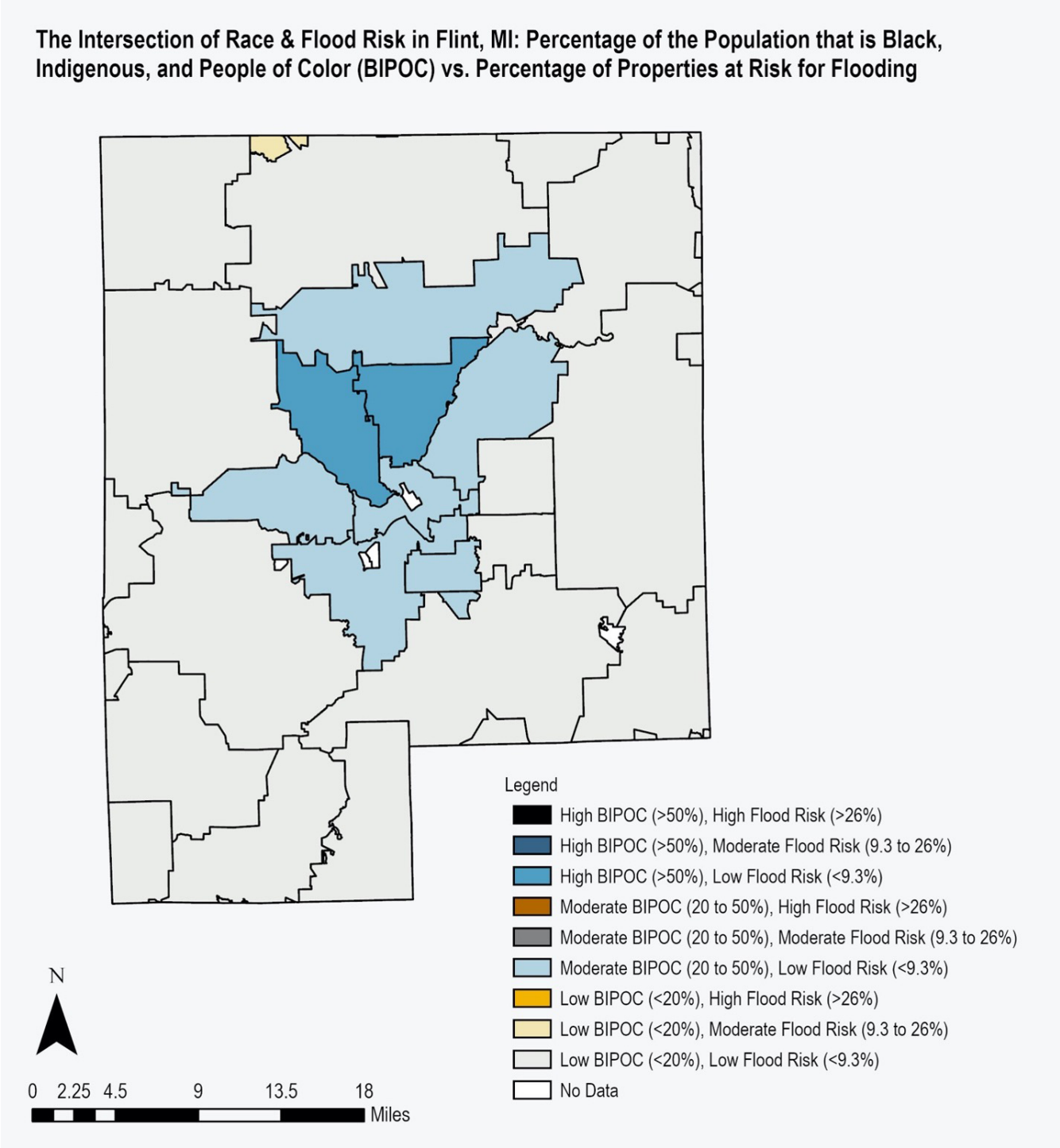
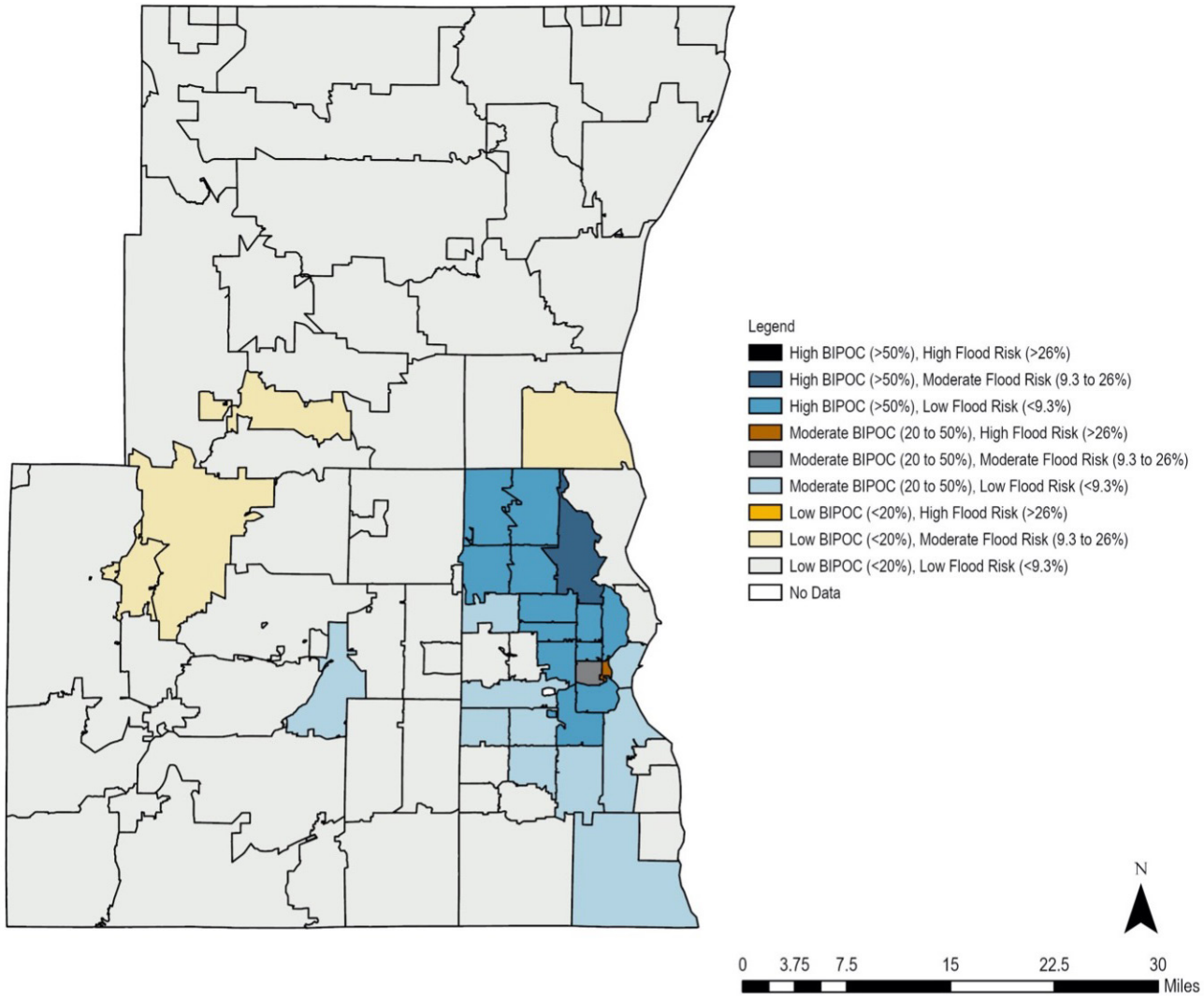


Figure 7: Intersectional Opportunities in the Milwaukee Metropolitan Area

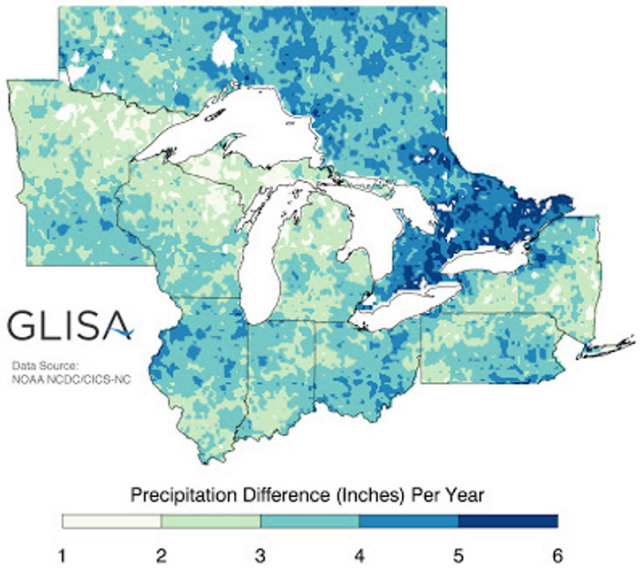
The Intersection of Race & Flood Risk in Milwaukee, WI: Percentage of the Population that is Black, Indigenous, and People of Color (BIPOC) vs. Percentage of Properties at Risk for Flooding



CLIMATE CHANGE AND URBAN FLOODING IN GREAT LAKES CITIES

Against the backdrop of racial segregation and inequality, the Great Lakes region is already experiencing increases in extreme precipitation events and urban flooding as a result of climate change (Pryor et al., 2014). From 1958 to 2007, heavy precipitation increased by 31% in Midwestern states (GLISA, 2013). Rainfall in the Great Lakes Basin was also 27 inches greater from 2015 to 2019 than prior average levels (NRDC, 2019). In 2019 the U.S. had fourteen weather and climate disasters with more than one billion dollars of damage. One of these was the 2019 Midwestern Floods that caused $6.3 billion in damages and four deaths. In a survey of Great Lakes municipalities in 2012, 80% reported that the volume of annual flooding complaints was medium or large (CNT, 2012). These trends are expected to increase in the Great Lakes region, with areas receiving between 1 and 6 additional inches of precipitation each year (Figure 8), making climate change an increasingly pressing challenge for Great Lakes cities in the coming years.

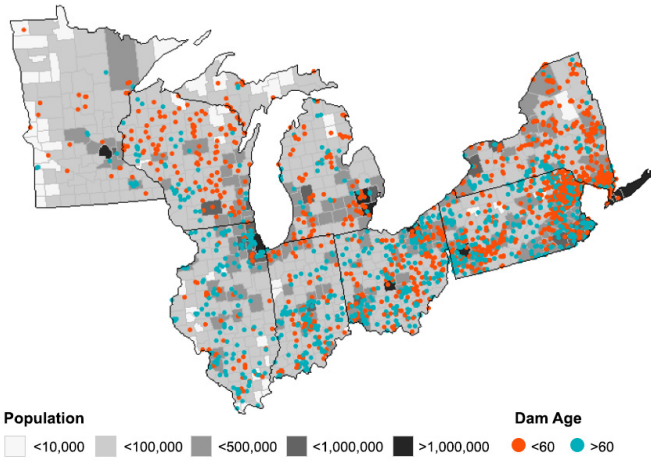
Figure 8: Projected change in Average Precipitation in the Great Lakes Region (2041-2070). *Source: Great Lakes Integrated Sciences Assessment*



These larger storm and rainfall events are also leading to failures in our critical infrastructure like dams, which can have deadly consequences for the Great Lakes Region (Figure 9). In May 2020, the Midland Dam failed during an extreme precipitation event that caused $200 million in damages to 2,500 buildings.

Many cities and communities across the region have begun to recognize the need to implement plans and policies to adapt to new patterns of flood risk and vulnerability. Box 1 highlights some of the steps taken by cities in the Great Lakes region as examples of the efforts underway to adapt to climate change.

Figure 9: High Hazard Dams and County Population Levels in the Great Lakes Region. *Source: Columbia Water Center*



BOX 1: ADAPTATION PLANNING HIGHLIGHTS FROM GREAT LAKES CITIES

Buffalo

Climate change adaptation in Buffalo has been led by a regional coalition of stakeholder groups and cities in Erie and Niagara Counties. The 2014-2015 One Region Forward effort engaged over 5,000 residents as well as various universities, community organizations, and local and state governments to develop flood adaptation strategies for the region (One Region Forward, 2015). Regional strategies in the One Region Forward plan include expansion of mixed-use housing and protection of natural lands and farmlands by targeting services, incentives, land use and flood insurance to establish sustainable, equitable patterns of adaptation. The One Region Forward master project also prioritizes community scale water management studies and coordinated steps to preserve and adapt floodplain areas through natural and built infrastructure.

Chicago

The Sustainable Chicago Plan update in 2015 highlights the importance of public space, such as school yards, for stormwater management and proposes a stormwater trading program under which sites with larger detention capacity could sell this capacity to other sites in need. These updates also included a digital sensor project named the "Array of Things" designed to provide localized climate and infrastructure data. The city's sustainability plan has also helped to inform a larger, regional campaign called "Our Great River," targeting the wider watershed and green infrastructure corridors.

Cleveland

In 2018 Cleveland updated its Climate Action Plan and developed the Racial Equity Toolkit and Guide, a product of twelve community workshops that encouraged prioritization of community needs and social equity in the city's environmental programs. These resources include materials and tools for community-centered vulnerability assessments and programs. The 2018 update also included plans to leverage capital investments able to "right size" existing infrastructure, including on-site stormwater capture systems.

Detroit

The Detroit Sustainability Action Agenda (2019) acknowledges and builds on the work done by community and organizations led by Detroiters Working for Environmental Justice, identifying key issues in equity and community-centered adaptation proposals for the city in the Climate Action Plan (Detroiters Working for Environmental Justice, 2011). The Sustainability Action Agenda establishes local sustainability ambassadors and connects with local community leaders, stewards and organizations that can facilitate workshops and connect resources between local communities and institutions (Detroit Sustainability Office, 2019). Detroit also forwarded adaptation strategies that use green infrastructure at a distributed, neighborhood scale and in street and greenway projects.

Flint

The Imagine Flint Master Plan develops several strategies for flood adaptation in Flint and its surrounding watershed, with a focus on the built environment along the Flint River such as setbacks and buffer zones able to prevent contaminated stormwater runoff from entering the river and expanded permeable surfaces throughout the city. The Plan highlights the need to capture and clean stormwater, and better monitor the river's water quality.

Milwaukee

Flood adaptation in Milwaukee has been led by the Metropolitan Milwaukee Sewerage District through the 2019 Resilience Plan (MMSD, 2019). The Resilience Plan takes a technical and designed centered approach to reshaping the built environment of the region, and builds on ongoing outreach and engagement processes initiated by the Re:Fresh Milwaukee planning process in 2013 (City of Milwaukee Sustainability Plan 2013-2023, 2013). The 2019 Resilience Plan emphasizes collaborative decision-making in watershed restoration, and establishes a Regional Resiliency Resource Center aimed at facilitating partnerships between local organizations, agencies and community stakeholders across the watershed.

DEFINING RACIAL JUSTICE IN URBAN CLIMATE CHANGE ADAPTATION

There are three ways of understanding justice in climate change adaptation: distributional justice, procedural justice, and restorative justice (Adger et al., 2006; Hughes, 2020; Jurjonas et al., 2020; Meerow & Newell, 2019). Distributive justice refers to the distribution of goods and infrastructure, environmental (dis)amenities, services, and opportunities, particularly for BIPOC and low-income communities. Procedural justice focuses on access to participation and decision-making for community members in the planning and implementation of adaptation strategies. Just procedures create a platform for local voices, incorporate traditional knowledge, and ensure fair representation of diverse populations—including socially vulnerable populations and those most affected by decision-making. By ensuring meaningful engagement of socially vulnerable populations, these populations regain power in the decision-making process, which helps to ensure their needs are met and to prevent future injustices (Jurjonas et al., 2020; Meerow et al., 2019). Finally, restorative justice requires that adaptation policy and planning address root causes of social vulnerabilities and inequality (Meerow et al., 2019; Shi, 2020). Addressing root causes through adaptation actions can help to "reverse existing inequalities and address their structural underpinnings" (Hughes, 2020, p. 38). When all three dimensions of justice are not incorporated in urban adaptation planning and implementation, new injustices can be created or existing injustices can be perpetuated (Meerow et al., 2019; Shi, 2020; Solis, 2020; U.S. Water Alliance, 2020).

Many cities are working to invest in adaptation strategies for socially vulnerable communities. However, if cities do not also prioritize the decision-making processes and larger institutional drivers of inequality and segregation, these investments may ultimately increase the vulnerability of already marginalized and underserved populations. For example, new green infrastructure investments for urban flood mitigation have at times led to "green gentrification," or rising housing values and neighborhood changes that benefit and attract wealthier (and often whiter) residents. This in turn attracts new investment and increases in property values, making these areas unaffordable for current residents (Gould & Lewis, 2017; Immergluck & Balan, 2018; Shi, 2020). Including communities in decision-making processes and raising awareness of the broader structural drivers of race- and income-based inequality can help prevent these unintended consequences of adaptation. Targeted universalism involves setting universal goals, assessing how population subgroups fare relative to the goal, and addressing barriers, structural impediments, and resource deficiencies in a targeted manner in order for all groups to meet goals (Michigan Department of Civil Rights and Gerald R. Ford School of Public Policy, 2018).

In the sections that follow, we develop principles and highlight examples and resources that can support local decision makers, planners, and advocates in centering racial justice to urban adaptation.

PART 2

CENTERING RACIAL JUSTICE: PRINCIPLES, TOOLS AND AVAILABLE RESOURCES FOR DECISION MAKERS, PLANNERS AND ADVOCATES

"When racial inequities are not openly acknowledged in climate action planning, it is likely they will be created, worsened, and/or perpetuated."—*Urban Sustainability Directors Network*

Centering racial justice in urban flood risk management and adaptation is critical for addressing the challenges outlined in Part 1. A growing number of city governments, planners, stakeholders, and advocates are committed to this goal, and a growing number of tools and resources are available to support this work. To support communities in moving forward in promoting racially just flood risk adaptation strategies in our region, we identify five key principles for centering racial justice in urban flood adaptation planning. We developed these principles through a review of practitioner reports, materials, and experiences; the peer reviewed literature; and existing proposals for best practices.

Five principles for centering racial justice in urban adaptation planning:

1. **Focus on Root Causes**
2. **Institutionalize Representation**
3. **Community-Driven Planning**
4. **Equity-Centered Data Collection and Analysis**
5. **Cross Sector Collaboration**

We describe these principles, provide some case examples of the principles in practice, and provide examples of planning tools and resources available to decision makers, planners and advocates.

PRINCIPLE 1: FOCUS ON ROOT CAUSES

Poverty, racial segregation, and income and wealth inequality are contributing causes of disproportionate vulnerability to urban flooding among BIPOC communities (USDN, 2017). Cities have typically failed to give attention to historical spatial injustices and segregation when developing adaptation plans and programs.

Racially just climate change adaptation addresses the root causes of inequality in communities (Movement Strategy Center et al., 2015). Three specific ways urban flood adaptation can target these root causes are through (1) improving the equitable distribution of environmental amenities that reduce flood vulnerability, such as green infrastructure (GI); (2) incorporating strategies that improve housing quality and security, and prevent displacement of low income and minority households, and (3) using adaptation programs and investments to create new jobs and business opportunities for marginalized groups (Box 2).

Equitable Access to Environmental Amenities, Including GI

Green infrastructure has been used as an adaptive technique in urban communities, which, as a permeable surface allows water to infiltrate the ground rather than running off and pooling in low-lying areas. Green infrastructure such as rain gardens, bioswales, and increased urban tree canopy not only reduce stormwater runoff, but also improve air quality, decrease urban heat island and provide a host of other health benefits depending on the technique used. However, green infrastructure can also have negative consequences if not informed by community needs, interests and vulnerability. BIPOC communities in segregated urban areas have experienced disinvestment and less access to environmental amenities, such as permeable green surfaces, than white residents. Tools such as the Environmental Justice Atlas for the Twin Cities, referenced under Principle 4, can aid municipalities in identifying communities lacking access to green spaces. Racially just data collection will identify which communities are most in need of increased green infrastructure to manage localized flooding. Just community engagement will involve residents in visioning what this green infrastructure will look like and what additional needs can be met through the investment.

Adaptation Strategies that Improve Housing Security and Stability

Green gentrification, also known as eco-gentrification, occurs when the development of new green amenities in communities leads to an increase in property values and the attraction of outside business interests and new residents, which price existing residents out of their neighborhoods leading to their displacement and migration to a neighborhood that may have even greater environmental and health risks. This displacement means that the community members for whom green infrastructure investments were intended do

not end up experiencing the increased environmental, health and economic benefits. There are a few techniques available to municipalities and planners to prevent displacement from greening projects. Key strategies include participatory planning, employing the "just green enough" approach, and hiring from within communities when implementing green infrastructure projects in order to decrease income inequality and financial pressures on residents.

Municipalities can increase resilience by limiting development in flood prone areas. However, these may be communities heavily populated by low income and BIPOC communities. As described in Part 1, institutional racism in housing practices pushed and consolidated people of color into less desirable urban areas. These areas may be low-lying and characterized by disinvestment that exacerbates the natural topography's contribution to flooding. Limiting development in these areas could have the unintended consequence of limiting the construction and availability of affordable housing. Cities should invest in (or promote investment in) additional affordable housing projects in neighborhoods that are not low lying or prone to flooding. Co-designing with communities ensures that the investment meets the needs of the specific residents located in close proximity and can reduce the investment's attraction to outside city residents whose needs were not considered.

Create Jobs and Business Opportunities for Marginalized Groups

There is a strong relationship between race and income, and BIPOC communities of the Great Lakes face disproportionately high levels of unemployment as outlined in Part 1. Reducing income disparities helps to protect residents from displacement. Flood adaptation investments in communities should seek to address poverty using a few key strategies:

1. Hiring locally, including the formerly incarcerated. Municipalities can target poverty and increase community adoption and support of green infrastructure by hiring locally for implementation and maintenance.
2. Awarding contracts to minority-owned businesses. Municipalities can award priority consideration for new development contracts to local, minority-owned businesses (Yuen et al., 2017) as is the case in Milwaukee, WI.
3. Developing training and skill building programs geared towards the un- or under-employed, with graduates given priority for jobs. Hiring and training community members to implement green infrastructure and other flood adaptation strategies provides residents with living wages and pathways to advancement within civil service and utilities. Municipal departments can partner with community organizations to execute green jobs training programs. These programs should be open to all community members including the formerly incarcerated.
4. Instituting renter protections. Municipalities can also introduce policies which protect low-income renters such as rent control and just-cause eviction laws (Yuen et al., 2017). These protections can help prevent displacement from green gentrification and/or other neighborhood investments.

Looking further into the relationship between race and income, planners will also identify a strong connection between race, income, and incarceration. Racially just strategies should also account for those with criminal records. 60-70% of those with a criminal history are unemployed. Those that are able to find employment can expect to see their history of incarceration reduce wages by 11% on average and reduce yearly earnings by 40%. Participation in transitional jobs programs, such as a green jobs program, can not only provide formerly incarcerated individuals with valuable skills and training, but also reduce recidivism by 40%. At current incarceration rates, approximately 1 in 3 African American males, 1 in 6 Latino males, and 1 in 17 white males will be incarcerated for some period of time. It is critical to not only prevent displacement from neighborhood investments, but also to leverage these investments to keep BIPOC in their communities rather than the carceral system.

The Tools and Resources below and following sections on Co-Owning Planning Efforts with Communities and Centering Equity in Data Collection and Analysis will further guide municipalities in partnering with frontline communities to identify root causes specific to their locales.

BOX 2: OPERATIONALIZING A FOCUS ON ROOT CAUSES

1. Equitable distribution of flood-reducing amenities like green infrastructure
2. Ensuring housing security and preventing displacement
3. Generating jobs and business opportunities for minority residents

A Focus on Root Causes in Practice

The Milwaukee Metropolitan Sewerage District (MMSD) released their Resilience Plan in 2019 which includes three visions. Vision 2 pertains to increasing economic vitality through job creation and equal access to opportunities. MMSD has already established a Workforce and Business Development Resource Program which maintains a database of disadvantaged businesses and has set procurement goals for minority-owned businesses. Vendor registration is required. Cities adopting similar practices will need to have equitable outreach strategies to ensure all relevant businesses are aware of programs such as this and have the resources and support required to register.

Detroiters Working for Environmental Justice (DWEJ) launched Build Up Detroit (BUD) in 1997. This program trained youth in GIS and guided them in mapping their community to identify clean-up sites. These sites were then targeted for revitalization through a green jobs training program where participants learned to redevelop abandoned brownfields into affordable housing. All trainees in the initial cohort were placed into jobs upon completion of the program. This multi-faceted approach to equity and sustainability cleaned and greened the City of Detroit while also decreasing income insecurity for local residents.

Examples of Available Tools and Resources for Focusing on Root Causes

Urban Resilience Integrated Framework - In 2015, Island Press and the Kresge Foundation released *Bounce Forward: Urban Resilience in the Era of Climate Change.* Within this strategy paper, a framework is provided for municipalities to ask, analyze, and act. This framework can be used in the initial stages of flood adaptation planning and should be revisited continuously. The **Ask** action step guides a municipality in investigating what is being made resilient, against what threats, and for whom. **Analyze** assesses the resilience of existing systems and their benefits, impacts, and gaps. **Act** works to protect, modify, and replace existing systems based on information gathered in prior steps.

The Urban Sustainability Directors Network's Racial Equity Evaluation Tool can be used by municipalities to assess organizational preparedness (informed by the assessment of BIPOC communities) and shift power to BIPOC communities and share decision-making.

PRINCIPLE 2: INSTITUTIONALIZE REPRESENTATION

Before a city undertakes racially just, community driven climate change adaptation, it should first commit to transformative organizational change. Failure to apply a racial justice lens internally will lead all external work to present as disingenuous and the department will lack legitimacy. Residents are more likely to trust a municipal planner that looks like them (Smith, 2019) and organizations which value diversity are more likely to effectively engage with diverse communities. However, in many urban communities in the Great Lakes region, local government agencies are not representative of the populations being served. They are therefore limited in their ability to advance racial justice (Ross et al., 2019).

The Government Alliance on Race and Equity (GARE) has set a goal for equitable workforce representation across the breadth and depth of local and regional government. Approximately, one third of workers at water and wastewater utilities are expected to retire in the next 10 years. There is an important opportunity present to diversify the workforce and connect marginalized communities with living wage jobs (U.S. Water Alliance, 2018). Inclusive hiring for jobs within the water sector can also help utilities and municipalities to establish relationships in neighborhoods severely impacted by urban flooding.

Equitable representation is realized when the workforce reflects the diversity of the community being served. The current method of assessing workforce representation equity in the public sector tends to involve reviewing federally mandated equal employment opportunity (EEO) reports. These reports use large racial groups and combine different job titles. Therefore, a more focused analysis is recommended in order to uncover where disparities exist.

Metrics for Institutionalized Representation

The equitable representation metrics we propose capture progress toward equitable workforce representation across the breadth of an organization. The equitable advancement metrics analyze representation equity across the depth of an organization. This analysis should be institutionalized across departments rather than solely assessing the sustainability office, for example. As discussed in Part 1, extreme racial wealth gaps persist in Great Lakes cities. Black, Indigenous, and other people of color should not only be equitably represented within organizations but also justly compensated. Organizations can advance justice by incorporating a wage equity metric into their assessments to ensure fair wages for all employees, especially BIPOC.

Equitable Representation

- Determine the racial composition of the workforce as a whole and compare to community racial proportions reported in the American Community Survey (ACS) to determine which racial groups are over or underrepresented overall
- Within each department compare the workforce composition to the racial, ethnic, and gender composition of the community (city, county, or state) it serves
- Assess gender representation within racial groups and compare to gender proportions within each racial group as reported in the ACS
- For larger non-white racial groups, such as Asian, assess the representation of subgroups such as Chinese, Japanese, and Vietnamese to see if select subgroups have higher access to employment

Equitable Advancement

- Determine the racial composition of the workforce across wage classification levels and compare each level to community racial proportions reported in the ACS to determine whether there is equitable advancement
- Assess gender representation within racial groups across wage classification levels and compare to gender proportions within each racial group as reported in the ACS

Wage Equity

- For civil service exempt classifications, analyze whether or not there are any wage gaps based on race or gender

Strategies for Institutional Representation

There are a number of strategies municipalities can employ in order to achieve workforce representation equity.

Inclusive Hiring Practices

The International City/County Managers Association (ICMA) found that exclusionary hiring practices and unnecessary job requirements barred or removed qualified candidates from hiring pools for local government positions (Smith, 2019). Exclusionary practices are ones which discourage qualified applicants from applying due to inappropriate language in job descriptions, inequitable notice and distribution of job openings, and discriminatory or biased assessment of a candidate's competencies. Departments should be wary of encouraging employees to share job postings within their networks as this tends to lead to hires which reflect the current composition of the workforce. This is otherwise known as in-group favoritism. Departments can improve workplace culture and encourage retention by valuing racial equity literacy as a qualification for employment and then building upon this foundation through policies and practices.

Equitable Retention

Equally important as operationalizing inclusive hiring practices to attract new, diverse talent, is maintaining the current diversity within the workforce. The following strategies seek to understand and improve the workplace climate to foster an environment which is welcoming and supportive for BIPOC employees:

- Conduct surveys or focus groups to better understand employee perceptions of workplace culture and climate. Poor climate can impair retention of diverse candidates.
- Disaggregate survey data by race and consider how responses vary across groups. Within racial groups, compare the responses between those who identify as men and those who do not identify as men.
- Develop an action plan to address any findings of concern.

BOX 3: OPERATIONALIZING INSTITUTIONALIZED REPRESENTATION

1. Track representation
2. Track equitable advancement
3. Track wage equity
4. Implement inclusive hiring practices
5. Encourage equitable retention

Institutionalized Representation in Practice

The City of Boston's Mayor's Office of Resilience & Racial Equity presented Resilient Boston in 2017, the City's resilience strategic plan. Resilient Boston includes four long-term visions, each with accompanying goals and initiatives. Vision 2, "Collaborative, Proactive Governance", identified employment equity as its first goal. In order to track progress towards this goal, this City created a diversity dashboard which measures and publicly shares data on overall representation, representation within each department, retention, and wage disparities, all disaggregated by race and gender.

Examples of Available Tools and Resources for Institutionalizing Representation

The Urban Sustainability Directors Network's Equity Foundations Training utilizes videos, worksheets, and a facilitator's guide to teach professionals how to apply a racial equity lens to their work and understanding of sustainability. Curriculum development was supported by the Government Alliance on Race and Equity, the Center for Social Inclusion, and Race Forward.

The International City/County Management Association (ICMA) released Beyond Compliance in 2019. This report presents case studies and methodology from four U.S. cities that have succeeded in creating diverse and inclusive workforces.

An issue brief from the Government Alliance on Race and Equity, Public Sector Jobs: Opportunities for Advancing Racial Equity, presents an overview of the current state, barriers, and strategies to achieve workforce racial equity in the public sector. Some strategies to achieve workforce racial equity will vary from one locale to another and need to be informed by the municipality's history and relationship with the community.

PRINCIPLE 3: CO-OWN PLANNING EFFORTS WITH COMMUNITIES

Inclusive and community-led adaptation planning have traditionally been framed through participatory planning frameworks. Participatory planning reflects a shift in the 1960s and 1970s towards greater democratic engagement between local communities and planning agencies (Rudd et al., 2017). While participatory planning can lead to an active design and planning process that centers on community needs and input, it can also be a symbolic process that lacks depth of inclusion, instead creating an impression of participation through outward facing processes meant for public buy-in (Iacofano and Lewis, 2012). These engagement strategies can create an image of inclusivity even though stakeholders may only be nominally involved in the process of climate adaptation or amplifying the demands of a particular group.

Justice in flood adaptation requires an active relationship with affected communities. Through a model of participation that centers on the co-production of knowledge in adaptive processes, and co-ownership of decision making between communities and decision-makers, flood adaptation can become a transformative process. We identify four key strategies for urban climate change adaptation that foster co-ownership in planning: engaging in the co-production of knowledge and co-ownership of decision making; ensuring representation and accessibility; using coalition-building strategies and systems-based framing; and linking flood adaptation practices to local lived experiences.

Co-Production of Knowledge and Co-Ownership of Decision-Making

While a participatory framework can be seen as time and resource intensive, particularly when working with technical information and data, the design and planning process can benefit from an extensive

participatory and shared ownership framework. The co-production of knowledge opens communications across multiple directions, sharing and expanding knowledge through interconnected processes that aim to connect stakeholder knowledge, to policy proposal, and ecosystem services (Yuen et al., 2017). Likewise, a shared ownership model works to develop a planning and implementation process owned, and shared by communities and local agencies, going beyond token representation and centering the decision making process on consensus building with communities stakeholders (*Facilitating Power,* 2019).

An equitable and participatory design process that bridges spaces between engineers, planners, government officials and community members can lead to greater production of information and shared knowledge across spatial levels and creates links between communities' daily experiences and wider policy and climate issues. This prepares community members with more technical knowledge on flood adaptation practices, while providing technical experts with local knowledge and data of flooding at a neighborhood and parcel level. With communities of color this is especially important when data may be historically under- or over-reported or failed to be considered at all when adapting to flood zones (Schell et al., 2020). How representation is defined, by who it is defined by and how planning spaces are made more accessible are key questions agencies will need to understand within local histories in order to be able to move towards a co-ownership planning model.

Communication across agencies, organizations and coalitions of grassroots organizers is pivotal for a climate action plan to best protect and enrich the futures of its most vulnerable communities. Though there may be existing tensions and conflicts between organizations and government agencies, it's important to create recurring and consistent spaces for communication across these interest groups in order to address tension and previous harms. Oftentimes planning agencies create various working groups or committees as a means of addressing these systemic issues. Understanding coalition and systems-based approaches to flood adaptation takes a broader scope at understanding systemic inequities in urban ecologies and the multi-faceted needs to address climate inequities.

Representation and Accessibility

Community ownership moves beyond marginalization of communities into a decision-making process where community consensus drives holistic and interconnected adaptive processes that are centered on racial justice. Moving from marginalization also means rejecting tokenization of community voices, such as bringing in BIPOC communities at the final step of planning processes for symbolic public feedback. Representation should go beyond singling out communities of color to carry out the labor of adaptive processes. Instead, relationships centered on the co-ownership of decisions should defer to community voices in shaping adaptation processes through mutual communication with agencies facilitating and connecting resources to these needs without driving the focus of these needs.

Digital outreach, localized community workshops, and networking between advocacy groups and organizations have immense potential in engaging community members around climate change. The increased use of digital platforms and social media has become a widespread response by planning agencies in attempting to adapt to COVID-19. While this has led to larger community forums, this digital transition has exacerbated preexisting inequities in terms of internet access and digital literacy, reigniting conversations around ableism in the design of planning processes and furthering underrepresentation of BIPOC communities in remote planning forums.

Though legally mandated across the U.S., many spaces for public comment organized by planning agencies may not adequately plan for an accessible planning space and engagement process for disabled communities. These are communities most affected by the ableism of design within sidewalks and other spaces that are taken for granted in the planning process. The principle of co-ownership moves away from marginalizing practices toward a process that centers community needs and elevates community perspectives, particularly the perspectives of those most affected by past planning practices.

Working to ensure consistent and secure internet access at a block-by-block basis can keep residents up to date on vital information during flash floods and recurring natural disasters in the short term, while accessing information and resources for longer term adaptation. A digital platform and recorded archives can benefit disabled communities, but singularly aren't enough to fully address the needs of disabled community members and those most impacted by climate change adaptation.

Coalition-Building and Systems-Based Framing

For communities who have been historically harmed, who have been displaced, or who face greater exposure to hazardous and toxic environments because of state actions, any climate adaptation proposal that is enacted by planning authorities will be seen with distrust and pushback. Regardless of administrative and political changes, these historic harms are embedded into the planning processes that have founded the development of cities on the displacement of Indigenous communities from flood safe areas and traditional migratory pathways into hazardous and harsh environments (Keene, 2017; Thistlethwaite et al., 2020).

City infrastructure has been founded on the displacement of Indigenous nations, and the enslavement of Black communities. In the industrial expansion of the United States the displacement and segregation of free Black communities into hazardous areas such as floodplains is one of multiple examples of the legacies and systemic impact of environmental racism in planning, such as the impact of Hurricane Katrina on Black communities in New Orleans, that have established a foundation of distrust between local communities and state actors (Rivera & Miller, 2007).

Transformative process towards a co-ownership of decisions, also involves addressing past harms and enabling spaces of reconciliation and healing. Planning agencies need to recognize the historic and systemic dispossession of land from Indigenous communities as an active process of dispossession that still shapes dispossession of Black, Indigenous, and Communities of Color. Through a co-ownership model, a participatory planning process addresses histories of harm with identifiable actions and refers to local communities as practitioners with embedded knowledge on the relationship between local and human ecologies (USDN, 2017).

Effective collaboration for equitable flood adaptation works in tandem with communities from the very beginning of a climate change adaptation plan to its ongoing and daily implementation. Building coalitions with local organizations across watershed geographies and centering the planning process on the lived experiences and histories of communities can provide the impetus to effectively organize and implement integrated flood adaptation strategies across all levels of a city. Building power through stakeholder buy-in can facilitate flood adaptation that connects streets and neighborhoods to the wider watershed and regional action network.

Linking Flood Adaptation to Lived Experiences

At the most basic level, a participatory planning process informs community members and "...provides the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions"(*IAP2 Spectrum of Public Participation,* 2018). At this stage engagement is one-sided, with community members only marginally involved as recipients rather than producers of knowledge. Climate action workshops can serve as a space for public feedback, or to ascertain details and priority actions for an adaptation plan. These spaces may increase the role of communities through consultation or direct involvement of local stakeholders. While this may provide local buy-in for a proposed adaptation draft, they may fall short of centering and integrating community knowledge and perspectives.

Equitable flood adaptation creates links between the wider ecosystem of a watershed to the lived reality of community members most impacted. Creating these links across geographies involves the empowerment of community members as active decision makers with unique knowledge on the impacts of climate change and flood adaptation. These climate action workshops and flood planning processes create a prescriptive rather than a proscriptive space for engagement where participants are involved as receivers, rather than as active producers of knowledge and power in the flood planning process. The benefits of an engaged and shared flood plan can provide an awareness and response capacity across neighborhood blocks, aiming for what USDN identifies as a community driven climate adaptation plan (Yuen et al., 2017) where stakeholders initiate and direct local strategies for adaptation.

Though flooding can be understood to broadly affect the ecosystem at large, its impacts can be unique at a hyper-local level. The subtle and quotidian impacts of living in a flood zone can be felt in the daily public health of community members, such as an increase in mold-related asthma, greater social vulnerability for senior citizens and issues of mobility for disabled community members isolated in flood prone areas (Lane et al., 2013).

BOX 4: OPERATIONALIZING CO-OWNERSHIP

1. Engage in knowledge co-production
2. Ensure representation and accessibility
3. Use coalition-building and systems-based framing
4. Link to local lived experiences

Co-Ownership in Practice

The development of formal gathering spaces and resource centers, such as Milwaukee's Regional Resilience Resource Center (RRRC), have the potential to provide a consistent and accessible space for community stakeholders and practitioners. The RRRC would provide a space for ongoing workshops and services centered around local knowledge while providing an open space where communities co-develop cohesive strategies and access resources.

Beyond physical spaces, a plan can also integrate the co-production of knowledge and shared decision-making through digital platforms. Open comment and digital feedback spaces, such as Detroit's use of the CoUrbanize social platform, is one step towards a shared planning process. Ensuring stipends and fair forms of compensation for local leaders and organizations allows groups to dedicate a reasonable and sustainable amount of labor that is compensated and valued, while connecting communities to further resources and active decision making in the planning process.

Guided by the Indigenous framework of 'all my relations', Toronto's Resilience Strategy approaches equity through a web of kinship where relationships are shared across various geographies and between living beings. Toronto's vision is one "where residents know the history of Indigenous peoples and are committed to taking action for Truth and Reconciliation".

People United for Sustainable Housing (PUSH Buffalo) founded the Green Development Zone (GDZ) program to address resident concerns of vacant lots and unaffordable utility bills in the West Side neighborhood. As a community developer, PUSH Buffalo purchased several lots and hired and trained neighborhood residents to redevelop them into green spaces and sustainable, energy efficient housing. The GDZ model is characterized by a bottom-up, community driven approach. For lots with no clear design solution, PUSH Buffalo hosted a Community Planning Congress to determine design solutions.

Cleveland's recent Climate adaptation planning efforts took a step towards addressing historic and systemic harms in the planning process. The City developed the Racial Equity Tool for its updated 2018 Climate Adaptation Plan, paired with a Community-Wide Vulnerability Assessment Template to address histories of harm by government planning officials and agencies, as well as ongoing inequities in the planning process. This toolkit provides a system-based resource for coalitions of communities, organizations and city agencies to identify a standard of vulnerability and a process of adaptation planning based on community-driven priorities and framed within wider systemic issues unique to each geography.

Examples of Available Tools and Resources for Fostering Co-Ownership

The Spectrum of Community Engagement to Ownership provides a toolset to identify where an action or policy may affect a move towards Community Ownership of planning processes. Activities and resources included in the plan provide context-based materials that can allow cities and communities to establish goals and actions that focus on consensus building and community generated ideas and needs.

The International Association of Public Participation created the Spectrum of Public Participation, a range of categories delineating participatory processes toward a shared decision-making process. Each step outlines key strategies and examples that demonstrate the extent to which a plan is centering community input.

Designed by the Pacific Institute and Oakland Climate Action Coalition, the Are You a Climate Change Survivor? tool provides activities to establish local community strategies for climate adaptation. These activities include asset mapping, a timeline of community histories, and an analysis of the short- and long-term steps needed to adapt to issues connected to climate change.

While the Map Your Future Toolkit was created for community groups, it can also be used by sustainability professionals to support community engagement. It involves surveying community members, identifying and mapping community assets, identifying current issues or needs, and visioning community resilience through long term steps.

PRINCIPLE 4: CENTER EQUITY IN DATA COLLECTION AND ANALYSIS

Cities cannot carry out racially just flood adaptation planning without centering the views and experiences of frontline communities, rather than exclusively relying on "experts" in data collection and analysis processes. We identify four key strategies for urban climate change adaptation that center equity in data collection and analysis: using data to identify frontline communities; valuing and incorporating both quantitative and qualitative data; conducting a root cause analysis; and disaggregating data along racial lines and spatial scales.

Identify Frontline Communities

Flood adaptation planning that centers racial justice should focus resources in frontline communities. Cities can identify these communities through a spatial review of community assets and vulnerabilities, and conversations with community leaders and community-based organizations. Although various standards exist on determining vulnerability, such as the Social Vulnerability Index methodology, these are often generalized across various cities and communities, and different dimensions of vulnerability may be prioritized differently by communities.

The NAACP has identified several pre-existing vulnerabilities and assets relevant to adaptation and that help to capture the potential for compounding and accumulating risks and exposures: air quality; homes within a 10-mile radius of a hazardous facility or toxic site (including brownfields); households with electricity shut-offs in the last 12 months; and households with water shut-offs in the last 12 months. Flooding does not impact all households in the same manner upon exposure. The most vulnerable populations will be those who experience multiple negative health and economic impacts, the accumulation of which puts them at a heightened risk. For example, residents living in neighborhoods with poor outdoor air quality, will be more vulnerable to the potential development of mold in housing after an extreme rain event. This vulnerability increases if the residents are renters rather than owners as they must rely upon another party to treat the mold condition. The same increase in vulnerability occurs if the residents are low-income and cannot afford to remediate mold and/or cannot utilize a sump pump to quickly remove water from a flooded basement due an electricity shut-off.

In addition to the resilience factors laid out by the NAACP, mapping green infrastructure assets in the city can reveal neighborhoods that may have low stormwater infiltration capacities. It is important for cities to understand how risks can compound and to focus resources in areas that will benefit residents who are the most at risk. Collecting and mapping the information described, along with demographic data, particularly race and income, can help to identify these communities.

To understand how different subgroups fare, indicators and data should be disaggregated by race (Brooks et al., 2016). This will reveal disparities across groups. Municipalities should also review indicators at the smallest geographic level possible to locate clusters of high vulnerability (NAACP, n.d.).

Value Qualitative Data

Community members should be involved in both the design of the data collection process and evaluation. This helps ensure that community needs are met and prevent negative unintended consequences. Cities should gather and use qualitative data, alongside more quantitative approaches, to determine where to prioritize flood prevention measures. Considering both quantitative and qualitative data is critical when working to advance racial justice. Failure to seek out and carefully review qualitative data can have the effect of increasing inequities present in data collection and data-informed decision making.

Municipalities can also survey or interview communities (using tools and strategies such as those included in the Tools and Resources section below) to gather insight into where flooding is happening beyond known (FEMA-identified) floodplains. Inclusive data collection could allow residents to mark flood locations on maps or identify intersections. Maps should be approachable and incorporate community landmarks rather than resemble more technical maps used by professional planners.

Conduct a Root Cause Analysis

Results-Based Accountability (RBA) is a tool that cities can use to center racial justice and disrupt tendencies to conduct business as usual. RBA planning starts with the end goal or vision and works backward until root causes are identified. RBA for urban flooding for instance would work with communities to determine what a resilient neighborhood and community would look like generally and specifically with respect to flooding, and then determine the actions required, and barriers to achieving this vision. Cities may want to incorporate community education tools to aid residents in thinking about resilience and adaptation, and how environmental, health, and economic outcomes are interrelated. Community involvement in the root cause analysis, and later data analysis, is an important strategy to avoid deficit thinking, which blames behavior or personal choice for disparities.

BOX 5: OPERATIONALIZING EQUITY-CENTERED DATA COLLECTION AND ANALYSIS

1. Identify frontline communities
2. Value and use qualitative data
3. Conduct a root cause analysis
4. Disaggregate indicators and data by race and at the smallest geographic scale possible

Equity-Centered Data Collection & Analysis in Practice

The Center for Neighborhood Technology (CNT) conducted extensive outreach and engagement to understand where flooding was happening and what improvements were desired in 6 communities of the Calumet Corridor, just south of Chicago. Survey responses were gathered, community meetings and educational workshops held, and a community steering committee was created. The team is kicking off a resident-run data collection process to take place from March 2021 - May 2022 where residents will take photos of flooded areas for upload to a mapping tool.

The City of Providence, RI partnered with the health department to share data and map where those with asthma, COPD, lung cancer, heart disease, preterm birth and low birthweight babies and/or childhood development impacts (e.g. ADHS and reduced IQ) were located in order to inform their climate justice planning efforts. Data sharing across departments can lead to a better picture of the health inequities, vulnerabilities, and opportunities for improvement in cities. Providence is also measuring and monitoring the level of environmental burden and investments being made in each neighborhood. By tracking and assessing the amount of public money spent in each neighborhood, the City will be able to identify disparities and focus funding in frontline communities.

The Center for Earth Energy and Democracy (CEED) developed the Environmental Justice Atlas for the Twin Cities in Minnesota. This spatial analysis tool allows users to overlap race with green space, tree canopy, poverty and several indicators for pollution and environmental hazards. Municipalities could develop tools such as this to aid in identifying frontline communities.

Examples of Available Tools and Resources for Equity-Centered Data Collection & Analysis

The Government Alliance on Race and Equity (GARE) Racial Equity: Getting to Results can be used to identify resilience metrics through a Results-Based Accountability process.

Rooted in Resilience's Local Resilience Assessment was created with an intended audience of individuals, schools, community centers/organizations, and city planners. This toolkit supports community education and data collection initiatives. Participants explore what makes a community resilient, assess the resilience of their community across a range of factors/features, and identify where improvements should be made. Planners can add flood-specific questions to this assessment. The included factors related to food, water, energy, transportation and housing, jobs and economy, and governance will impact resident vulnerability to flooding.

The City Health Dashboard can be used to map 37 measures of health including air pollution and park access at the census-tract level for cities across the country.

Cities can upload data, such as the locations of green infrastructure, to the Spatial Justice Test to determine if the demographic make-up of those located near the set of points differs from those living further away with respect to race and income. Note that this test gives a summary view of access to environmental amenities and planners must also assess access more granularly at smaller geographic levels in order to advance racial justice.

PRINCIPLE 5: FACILITATE CROSS-SECTOR COLLABORATION

Centering racial justice in adaptation requires systems thinking and intersectoral collaboration (Rudolph et al. 2015). Numerous local, regional, and federal entities manage flooding. Watersheds and floodplains do not match jurisdictional boundaries. There is a need for coordination both horizontally and vertically to assess regional hydrology and regional exposure to flood hazards, and to develop regional flood adaptation measures. Additionally, there are dozens of federal, state, and local agencies and organizations working on assessing flood risk. Governance is typically fragmented and the management of flooding poorly regulated. There is a need for greater cooperation and coordination across these organizations to better understand flood risk and create an equitable flood management regime. Responding to the challenges of urban flooding, and centering racial justice in that response, will require coordinated efforts (U.S. Water Alliance, 2020).

Coordinate Across City Departments

Planning and policy development often occurs in silos and coordinating across organizational and institutional boundaries can be challenging. People will often bring different approaches and values to shared questions and issues and have different experiences with centering racial justice in their work. Urban flooding presents environmental, health and urban planning related risks and challenges. Therefore, adaptation to flooding—and particularly adaptation that centers racial justice—should involve collaboration and coordination across sectors and government departments (USDN 2017).

Consider Diverse and Non-Traditional Partners

Cross-sector collaboration on urban flooding may involve partnerships between planning and zoning, transportation, water quality, public works, waste and sanitation, emergency management, and public health agencies. Collaborative planning should consider the maintenance and further implementation of preventive measures such as parks, trees, permeable pavement, and green infrastructure in addition to warning and evacuation plans. Centering racial justice also requires the participation of agencies focused on public health, sustainability, economic development, and transportation.

Unlikely and non-traditional partners and those who may have been avoided in the past should also be considered, as should the rationale behind excluding them and any implications that choice may have had for advancing justice (GARE 2015). Cross-sector collaborations advancing racially just flood adaptation should not only have diversity across issue areas and foci but also across institutions. Backbone agencies should consider involving non-profit organizations, community groups, neighborhood associations, and more, in addition to local government departments.

Acknowledge Past Harms

Before institutions or departments can collaborate on forwarding racial justice in flood adaptation planning, they must first acknowledge their role in perpetuating institutional racism and their upholding of systems and practices that have excluded marginalized groups. Practitioners and leaders must acknowledge white supremacy and the ways it has been beneficial to white communities. The backbone agency of the cross-sector partnership should be transparent and honest about partners' past performance and challenge themselves and all partners to institutionalize racial equity (Bernabei, 2017).

BOX 6: OPERATIONALIZING CROSS-SECTOR COLLABORATION

1. Coordinate Policy & Initiatives Across City Departments
2. Engage Non-Profits, Community Groups, and Neighborhood Associations
3. Consider Non-Traditional Partners
4. Acknowledge Past Harms

Cross-Sector Collaboration in Practice

The City of Des Moines, IA is employing a multi-pronged, cross-sector and regional approach to flood adaptation planning. After severe floods, FEMA provides the city with funding for buyouts. However, when the relief inventory eliminated affordable housing, the City changed course and the Public Works department now engages with communities to discuss voluntary buyout options. At the same time, multiple departments including water and transportation are collaborating on placing green infrastructure and detention basins in communities at high risk of flooding to slow the water and allow it to infiltrate. The City is also coordinating with the Metropolitan Planning Organization (MPO) on regional stormwater management.

Examples of Available Tools and Resources for Cross-Sector Collaboration in Practice

The American Public Health Association and Public Health Institute published Health in All Policies in 2013. Recognizing the barriers that planning silos present to addressing social determinants of health, the field of public health has adopted a Health in All Policies (HiAP) intersectoral approach. ***Intersectoral*** is a term used in public health to refer to work which takes place outside of health departments but affects health outcomes. Typically, this work is done in partnership with the health department. A similar model could be adopted by all stakeholders involved in urban flood adaptation work beyond sustainability offices.

The Movement Strategy Center's Nuts and Bolts of Building an Alliance toolkit guides collectives in establishing their function and mode of operating. Function is the product of structure, culture and strategy. The toolkit does not focus on strategy, but rather how structure and culture relate to strategy, questions collectives must address to determine their culture and strategy, and common pitfalls.

PART 3

EVALUATING PROGRESS TOWARD RACIAL JUSTICE IN URBAN FLOOD ADAPTATION

Current evaluation approaches are often not well-suited to monitoring and evaluating progress toward racial justice in urban flooding adaptation policy and planning. Many cities struggle to systematically track how flood mitigation funding is spent across neighborhoods. Often, the data available to understand the equity implications of flooding mitigation strategies are unavailable or require additional resources to collect and aggregate. Novel technologies, such as green infrastructure (GI), have not typically been assessed to ensure equitable project siting and maintenance. It is not common practice to include residents in evaluation processes. All of these challenges and gaps hinder cities' ability to fully evaluate the implementation of flood mitigation strategies and their contributions toward racial justice. However, these obstacles are not insurmountable. We highlight four evaluation strategies that can help support racial justice in urban flood adaptation.

TRACKING DISTRIBUTION OF FUNDING AND INVESTMENTS

There are many funding streams that cities use to reduce urban flood risk and adapt to climate change, from local revenue to a variety of federal grants and loans to private and philanthropic funding. Current evaluation approaches often fail to track how these funds are spent across a city. This can result in wide discrepancies of funding and projects between neighborhoods. Practitioners involved in mitigating urban flood risk must explicitly examine the distribution of funding for flood mitigation and disaster response across racial groups and neighborhoods. This data must be transparent and accessible to the public.

Cities should work to track how stormwater budgets are being allocated geographically across the city to ensure the equitable distribution of funding. As cities collectively funnel hundreds of millions of dollars into new stormwater projects, they should consider whether projects are equitably distributed across neighborhoods; where the most costly and ambitious projects are being built; and whether predominantly white neighborhoods receive more funding than neighborhoods that are predominantly BIPOC. Equity-based budgeting is an emerging strategy for ensuring that funds are spent in historically underserved neighborhoods (Barrett and Greene, 2021). Tracking and evaluating the communities and issues prioritized in capital investments and asset management strategies can also help illuminate any racial disparities.

In addition to city stormwater budgets, there are a number of sources of federal and state funding available to cities for building flood mitigation projects, from FEMA's Hazard Mitigation Grants and Building Resilient Infrastructure and Communities grants, to HUD's Community Development Block Grants. Cities can track how federal and state hazard mitigation funds are disbursed, and which neighborhoods are being prioritized for funding. While cities certainly collect data on federal and state funding, these funding streams should be systematically quantified and any data on these funds should be easily accessible to the public. In this way, cities and residents can begin to understand the pattern of flood mitigation funding across the urban landscape.

Renters have long been overlooked as a population impacted by flooding and in need of adaptation investments and collecting data about this group of residents is important. A 2020 investigation found that renters are less likely to have information regarding their flood risk than homeowners, in large part because landlords are not required by many states and jurisdictions to disclose flood risk (Hersher, 2020). The investigation found that of "29 states that require disclosure of flood risk during real estate transactions... only one mentions tenants" (Hersher, 2020). This is an equity issue facing municipalities and regions: in 2016, 58% of Black households across the U.S. were renters, while 54% of Hispanic households were renters (Cilluffo et al., 2017). Only 28% of white households rented in 2016 (Cilluffo et al., 2017). Researchers studying New Orleans post-Hurricane Katrina found that Black mothers who were renters or who lived in public housing prior to the storm were far more likely to relocate (or be displaced) after the hurricane hit than Black mothers who were homeowners (Fussell and Harris 2014). The impact of flooding on renters disproportionately impacts BIPOC communities.

Cities should investigate how flooding impacts housing stability, including whether renters in the city are moving either due directly or indirectly to flooding events. Additionally, cities should review avenues for tenants to pursue actions if their landlord does not clean up a property after a flood event, and whether there are incentives for rental property owners to pursue individual flood hazard mitigation actions. When property owners do pursue individual flood

hazard mitigation actions, steps should be taken to ensure they do not displace low-income residents with higher rents (Fussell and Harris 2014). Cities should also understand how renters recover from flooding events, such as whether they have filed renter's insurance claims.

USING DISAGGREGATED, ACCESSIBLE, UPDATED DATA

Data are typically not effectively disaggregated in a way that facilitates evaluation in support of racial justice. Cities need disaggregated, accessible, and updated data to understand how flood hazards are distributed and to distribute adaptation projects in a way that addresses racial disparities.

It can often be challenging for cities to obtain the data that they need to systematically evaluate equity in their flood mitigation strategies. For example, as cities update and modernize grey infrastructure and build new green infrastructure (GI) and low-impact development (LID) projects, it is important that they understand where projects are concentrated, who benefits from projects, and who remains vulnerable. However, this might require additional municipal resources and capacity dedicated to tracking GI and LID projects. Additionally, while cities should understand racial and income disparities in flood insurance coverage and claims, flood insurance information can often be difficult to aggregate and compile. Populations that are often missing from conventional data collection, such as renters, should be prioritized for study and data monitoring; this may require cities to seek and collect additional information that is not readily available. Despite these challenges, this information allows cities to better understand the risks BIPOC face and begin to track whether the city is ensuring equity in flood mitigation planning; the additional resources that may be necessary to collect, maintain, and evaluate this data can help cities better understand disparities and discover inequities.

Mapping flood infrastructure at a city-scale: As cities build green infrastructure projects, update CSOs and older stormwater infrastructure, and put in new flood control measures, it is critical that these projects are appropriately mapped and that cities have access to relevant GIS data to understand the location and scope of these projects. Cities need to know where green infrastructure projects are being built throughout the city. This data can be used to ensure that projects are equitably distributed throughout the city or to preferentially site green infrastructure projects in communities of color (Heckert & Rosan, 2016; Meerow & Newell, 2017). Many cities are overhauling outdated CSO systems; relevant departments need to know which communities are being targeted for CSO removal or remediation to ensure that efforts are reaching all communities, not just wealthy, white communities or downtown business districts. "Hard" infrastructure such as seawalls, levees, and dams are aging and, in many cases, predate federal flood maps; the city should know where flood protection infrastructure is located throughout the city. Information about this infrastructure will allow relevant parties to see which neighborhoods benefit due to these projects, and which neighborhoods are at risk. Ideally, cities would capitalize on or build capacity to layer this data to understand differentiated flood risk and investment across the city.

Understanding changing flood risk across neighborhoods: City and regional officials engaged in flood risk management need better tools and metrics to understand how GI and LID projects shape flood risk both across the urban landscape and specifically in BIPOC communities. Decision-makers need metrics and indicators that demonstrate the hydrological, financial, and health impacts of GI and LID projects at a neighborhood scale. The inaccuracy of official maps necessitates cities and regions locating additional

sources of information to supplement FEMA's flood maps. Private sector mapping efforts, such as First Street Foundation's Flood Factor, may give cities better insight into where they are experiencing enhanced risk. Additionally, cities should anticipate the rollout of FEMA's Risk Rating 2.0 in October 2021. Although the details remain vague, FEMA intends to release more accurate flood risk maps through this program rollout.

Some flood mitigation projects affect 'downstream' communities in the watershed by redistributing flood waters from one community to another (Liao et al. 2019). As cities consider updating older levee systems, dams, seawalls, and other 'hard' infrastructure in particular, they should consider regional hydrology to ensure they are not disadvantaging some communities in order to protect others.

Flood insurance claims can help capture flood risk and experiences in the city. Cities and regions can work to locate and use data on the racial and income breakdown for insurance coverage, insurance claims, and insurance payments in their jurisdiction. This information will help cities begin to address questions about flood risk and equity in flood protection, such as whether there are racial disparities in flood insurance coverage, whether there are areas outside of identified floodplains with a large number of flood insurance claims, the typical size of insurance payouts across neighborhoods, and whether there are neighborhoods with repeated property losses. Data on racial and income disparities in flood insurance coverage, claims, and payments allow cities and regions to better understand racial disparities both inside and outside the identified floodplain. More broadly, insurance claim and coverage information allow cities to identify where current maps incorrectly demonstrate flood risk. National Flood Insurance Program (NFIP) data should be supplemented with other data sources to understand a city or region's flood risk. This may include work on the part of city or regional officials to aggregate information from creative or nontraditional sources (for example, 311 calls regarding flooding). Additionally, it is critical that city and regional officials collaborate with communities and community organizations to collect data on flooding impacts (especially in communities that have low contact with government services).

Community-defined indicators of vulnerability and assets: Fundamental to flood adaptation is capturing and incorporating communities' own assessment of their vulnerabilities and assets. These conversations should occur in tandem with conversations addressing the systemic harm done to communities and while working to understand how these legacies shape the context and position of power in the proposed planning process. Through reflections on these historic harms, vulnerability assessments, and action priorities, a process can be established centering these systemic issues and producing scaffolded strategies to address immediate and long-term needs.

Measuring co-benefits and networks of impact: Climate change adaptation actions ripple through the interconnected systems of local urban ecologies and infrastructures. In understanding the efficacy of a climate action proposal, communities and practitioners can identify the extent of impacts across different social and ecological networks. These relationships can be visualized a myriad of ways including through network analysis, asset mapping with communities, and inventorying environmental services through agencies and organizations.

Open data sources: Open data sources that are readily accessible present opportunities for communities to develop their own research priorities. Enabling active data gathering between communities, organizations, and agencies can be facilitated by an interactive and digital space where residents can actively contribute through accessible and empathetic design. Creating a digital space accrediting the work of community

members and establishing community funds and grants for participatory action research proposals, can create links between community interests and ongoing climate actions. Tying these programs across linguistic groups and different levels of digital literacy can include members with lived and technical knowledge to share and develop resources across language groups.

ASSESSING THE EQUITY DIMENSIONS OF GREEN INFRASTRUCTURE

Green infrastructure (GI) is increasingly becoming a dominant flood risk reduction and climate change adaptation strategy. Cities are also turning to GI to meet their obligations under the Clean Water Act and decrease the impacts of stormwater events on CSO systems (Chaffin et al., 2016). We are just beginning to understand the impact of GI projects on neighborhoods and communities. Some research suggests that urban greening can lead to neighborhood change and displacement (Clement & Kanai, 2015; Gould & Lewis, 2017). Cities can systematically track GI projects to evaluate the short- and long-term equity impacts on the communities where they are located.

GI and neighborhood change: A growing field of research has identified instances where urban greening projects, including GI, has led to neighborhood change and displacement (Clement & Kanai, 2015; Gould & Lewis, 2017). A study in Philadelphia found that urban greening efforts such as tree plantings, median plantings, and pocket parks "impart[] a considerable increase in surrounding home values…on the order of a 28% gain in value relative to similar homes in comparable areas without streetscape improvements" (Wachter & Gillen, 2006, p. 5). These dynamics are complex, particularly for 'shrinking cities' with higher vacancy rates and different patterns of displacement than many of the major metropolitan regions where this phenomenon has been studied. Cities need to begin to quantify the impact of GI projects on neighborhoods and housing tenure, including tracking neighborhood change and displacement in areas where GI and LID projects have been built and working with community groups and residents to track neighborhood change.

Financing GI: It is critical that cities systematically track how GI projects are funded, who is funding them, and how funding is dispersed regionally. This data can be used to assess which neighborhoods and residents are prioritized for both private and public funding. With this data, cities and regions can understand patterns of investment and disinvestment and can track any racial disparities in GI funding. This is particularly relevant in regions with a high level of segregation and significant differences in municipal capacity.

GI project communication: Cities must evaluate the quality of their communication with neighborhood residents about GI projects. Communication is a vital component of GI project siting, especially in neighborhoods with a history of institutional abuse, racism, and neglect.

The city should track the level of neighborhood engagement with neighborhood residents and organizations prior to GI project siting, and whether relevant departments have maintained communication, education, and outreach with neighborhood residents about GI projects.

GI maintenance: Cities should systematically evaluate how GI projects are maintained after they are built. Some GI projects fail due to poor maintenance, particularly in disinvested neighborhoods (Heckert & Rosan, 2016). Additionally, researchers have found that GI can have negative public health ramifications, particularly due to problems arising from rat and insect pests (Lõhmus & Balbus, 2015). Cities should track who is taking care of GI projects, and whether

the city has invested adequate funding and resources toward GI maintenance, particularly in BIPOC neighborhoods. Additionally, cities should review their interactions with neighborhood residents about GI maintenance. The city should consider whether there has been substantive and ongoing communication with neighborhood organizations and residents about GI maintenance and care.

SUPPORTING LONG-TERM, COMMUNITY-LED MONITORING

One of the most fundamental ways that cities can integrate racial justice in the evaluation of urban flooding adaptation is by substantively including residents in evaluating and monitoring flood risks and adaptation over the long term.

Embedded planners and community-centered trainings: Community-led monitoring centers the lived experiences of community members. Whether in the assessment of vulnerabilities, assets, priorities, and potential climate actions, community led monitoring develops metrics and processes driven by community input. These include internal and external assessments of the accessibility of a space, laying out a map of community connections, and committing accessible resources and information to communities through embedded planners working at the community level.

Local, accessible sensing technology and mutual data collection systems: The COVID-19 pandemic has revealed large disparities perpetuated by planning practice, but one in particular is the digital inaccessibility for communities of color. Creating open data sources, such as Chicago's Array of Things (*A Guide to Chicago's Array of Things Initiative,* 2018) move towards an adaptation process where knowledge is co-produced. But these actions need to be backed by initiatives that address the lack of digital literacy and access. These processes, paired with shared knowledge-gathering, enable participatory action research and the prioritization of climate actions by community members and grassroots organizations. Local perspectives and knowledge of ecosystems can then address environmental hazards at a hyperlocal and quotidian level. Workshops for various age groups and communities can establish an intricate relationship between technical data and residents' lived experiences.

Intergenerational transitions and archiving: Making the space for intergenerational dialogues also provide key frameworks to think of the impact of climate change across the unique vulnerabilities of different communities and age groups. Intergenerational spaces aren't just to address vulnerability, though; they also provide a shared dialogue and insight into the long-term impacts of climate changes across the lived experience of community members with knowledge of the local ecosystem across generations. Making data and narrative sharing spaces available across groups can uplift the communities' history and reflect ongoing struggles from a vantage point across time and projecting into future opportunities and openings.

EXAMPLES OF JUSTICE-CENTERED EVALUATION IN PRACTICE

Hurricane Harvey caused widespread destruction on the Gulf Coast in 2017 ("Houston Chronicle's Most Powerful Photos of Hurricane Harvey," 2018). A year after the storm hit, Harris County, Texas passed a $2.5 billion bond that would allow the county to prepare for future storm and flooding events (Despart, n.d.). In 2019, the Harris County Commissioners Court passed a resolution (the ***Harris Thrives Resolution***) that "instructs the Harris County Flood Control District (HCFCD) to adopt a framework that ensures a process for the equitable expenditure of Bond Program funds" (Harris County Commissioners Court, 2019, p. 1).

The *Harris Thrives Resolution* also stresses community involvement in the equitable implementation of the bond; local organizations such as the Coalition for Environment, Equity, and Resilience (CEER) and Bayou City Waterkeeper were key in the push for the resolution (Goshen, 2020; Macha, 2019). Striving to meet resolution objectives, CEER and partners restructured the HCFCD Community Flood Resilience Task Force to better reflect the diversity and expertise present in the county. The equity-centered task force now includes community members and is charged with creating an equity scorecard to evaluate policy and investment implementation (Gonzalez, 2021). The *Harris Thrives* resolution resulted in a publicly available dataset that allows residents to view how the $2.5 billion bond has been spent across the city, presenting residents with the opportunity to see where resilience and recovery projects have been built throughout Harris County. Additionally, the website tracks how the bond has been spent by source of funding and by use of funds. This open data portal allows residents to understand how money is being spent across the county, and which communities are prioritized for funding.

Over the course of several facilitation and work sessions, communities across 5 of the major municipalities of Vancouver's urban core worked with researchers and agencies to identify their own indicators of social vulnerability to climate change (Oulahen et al., 2015). Comparing these results to traditional valorization of indicators in a SoVI model (the standard for measuring social vulnerability), discrepancies were found across variables that had been used often by planning agencies to establish social vulnerability categories for different communities. The use of the SoVI model used indicators, such as the percentage of residents with a higher education, to develop a measurement of a community's vulnerability. Through the research in Vancouver, indicators from traditional testing differed from what residents had identified as greater or lower priority for their own needs.

CONCLUSION: MOVING TOWARD A JUST, RESILIENT FUTURE

Racial and spatial segregation in Great Lakes cities generate uneven exposure to current and future flood risks and worsen the economic and health consequences of current and future flooding for BIPOC communities. When cities create planning or evaluation tools without acknowledging the presence of institutional and structural racism, climate change adaptation may reinforce existing inequality and preclude transformative change. As we undertake the challenge of adapting our cities to climate change, it is critical that these disparities are accounted for. Failing to center racial justice in urban adaptation not only neglects those communities most affected by climate change, but it can also produce decisions and investments that exacerbate current inequalities. Learning and sharing between cities and regions will be critical for moving forward.

Truly centering racial justice in urban adaptation requires personal, organizational, and institutional transformations in our cities. As much as it requires new strategies for planning and policy, centering racial justice also requires new mindsets and reckoning with our own biases. These are universal challenges for American cities. The Great Lakes region has always been a place of diversity and potential. Its experiences and challenges with racial justice and climate change adaptation can serve as useful examples and context for other regions struggling with similar issues. Centering racial justice in urban adaptation and stormwater management strategies can serve as a critical linchpin as we work to realize a new chapter for the Great Lakes that provides economic opportunity for all residents, strong and equitable communities, and a healthy, clean environment.

APPENDIX: PERFORMANCE METRICS FOR CITIES

There are concrete ways that cities and regions can begin to evaluate where they are in centering racial justice in their flood planning efforts. This preliminary checklist is designed to help cities and municipalities take important steps towards creating an urban flood mitigation and adaptation strategy that incorporates the five principles and evaluation strategies outlined in this report.

1. Community-Driven, Shared Leadership

- ☑ Acknowledge the legacy of mistrust and harm between local government and communities prior to commencing community engagement/collaboration.
- ☑ Confirm that local government/planners support community leadership development.
- ☑ Engage local government/planners in frontline community readiness (climate change-oriented trainings/education/outreach).
- ☑ Establish a community advisory board; include grassroots organizations and BIPOC.
- ☑ Distribute communications in multiple languages and make interpreters available at meetings.
- ☑ Make racial equity training resources used by the City publicly available/accessible to community members.

Plan Inputs

- ☑ Provide digital, multi-lingual platforms for communities to shape planning narrative and formats.
- ☑ Provide a networking platform and coalition building space for community leaders, activists, and grassroots organizers to provide input into flood planning.
- ☑ Make sure there is an equitable geographic distribution of flood mitigation workshops and engagement events across the city
- ☑ Provide accessible engagement processes and inclusion of disabled community members.
- ☑ Center the plan on local Indigenous communities' historic and current environmental practices and relationships.
- ☑ Facilitate workshops between technical partners/agencies and local community stakeholders early on in the planning process.

Plan Actions & Substance

- ☑ Learn how stakeholders prioritize assets and define vulnerability.
- ☑ Conduct a community assessment of assets and critical infrastructure.
- ☑ Clarify the connection between broad climate change issues and local environmental hazards identified by residents.
- ☑ Identify local leaders and stewards as key partners for long-term local actions.

Plan Outputs

- ☑ Operationalize local engagement strategies so that communities can carry out actions.
- ☑ Provide a transparent platform for updating community assessment and indicators.

2. Equitable Data Collection & Analysis

- ☑ Identify frontline communities for flooding and priority areas for engagement.
- ☑ Track and assess the amount of public money spent in each neighborhood.
- ☑ Focus funding on frontline communities.
- ☑ Involve frontline communities in decisions about data collection.
- ☑ Conduct a root cause analysis of disparities in flood vulnerability in collaboration with frontline communities.
- ☑ Collect qualitative and quantitative data.
- ☑ Review indicators at the smallest geographic level possible.
- ☑ Disaggregate data and indicators by race.
- ☑ Involve frontline communities in data evaluation.
- ☑ Publicly share data, e.g., on an open data platform.

Green Infrastructure and Neighborhood Change

- ☑ Conduct an inventory of green infrastructure projects.
- ☑ Implement green infrastructure projects in frontline communities.
- ☑ Substantively involve frontline communities in the siting and maintenance of green infrastructure projects.
- ☑ Conduct analyses of the impact of green infrastructure projects on neighborhood change.

3. Institutionalized Racial Equity

Equitable Representation

- ☑ Benchmark the racial composition of the workforce as a whole against the racial composition of the community served.
- ☑ Benchmark gender proportions within each racial group against that in the community served.
- ☑ For larger non-white racial groups, such as Asian, assess the representation of subgroups (for example, Chinese, Japanese, or Vietnamese community members).

Equitable Advancement

- ☑ Compare racial composition at each wage classification level to community racial proportions.
- ☑ Compare gender representation within racial group at each wage classification level to community gender proportions within racial groups.
- ☑ For larger non-white racial groups, such as Asian, assess the advancement of subgroups (for example, Chinese, Japanese, and Vietnamese community members).

Wage Equity

- ☑ Analyze potential wage gaps based on race or gender for civil service exempt classifications.

Retention

- ☑ Conduct surveys or focus groups to assess workplace culture and climate.

Inclusive Hiring Practices

- ☑ Remove questions about criminal history from employment applications.
- ☑ Use criminal background checks only if charges relate to the position.
- ☑ Review minimum qualifications listed on job postings for relevance.
- ☑ Remove educational requirements that aren't required to carry out the job.
- ☑ Accept experience as a permissible substitute for education.
- ☑ Confirm that the skills listed in a job description match those required to carry out the job.
- ☑ Include questions that assess a candidate's understanding of racial equity on the job application.
- ☑ Assemble a diverse hiring board to assess candidates
- ☑ Provide multiple methods for applying to job openings.
- ☑ Ensure departments provide candidates with support in the application process
- ☑ Have hiring managers complete unconscious bias training.

Employee Training/Capacity Building

- ☑ Have departments commit to ongoing racial equity trainings for all employees.
- ☑ Have departments institute racial equity policies.
- ☑ Have departments institute a racial equity action plan.
- ☑ Have departments establish a racial equity team.
- ☑ Have departments establish protocols for addressing incidents of racial bias.

4. Address Root Causes/Transformative Approach

- ☑ Have departments incorporate root causes identified by frontline communities into agency strategic or action planning.
- ☑ Have departments commit to hiring locally.
- ☑ Have departments commit to awarding a percentage of contracts to minority-owned businesses.
- ☑ Have departments host or support training and skill building programs for under-employed residents.
- ☑ Have departments host or support training and skill building programs for formerly incarcerated populations.

5. Cross-sector Collaboration

- ☑ Have city agencies and partners acknowledged past equity performance and need for improvement.
- ☑ Ensure city departments are collaborating in order to address urban flooding.
- ☑ Ensure city departments partnering with non-governmental organizations to address urban flooding.
- ☑ Ensure partnerships are in place with neighboring jurisdictions where residents may live or work.
- ☑ Work with county and regional planning units to address regional flood hazards and to adopt integrated flood mitigation projects.
- ☑ Support and engaging tribal governments on water issues in the region.

RESOURCES CITED

A Guide to Chicago's Array of Things Initiative (S. Thornton, Trans.). (2018). Harvard Kennedy School; Ash Center. A Guide to Chicago's Array of Things Initiative

Adger, W. N., Paavola, J., Huq, S., & Mace, M. J. (2006). Fairness in Adaptation to Climate Change. MIT Press.

Andrew Rudd, Malone, K., & Bartlett, M. (2017). Participatory Urban Planning. In Urban Environmental Education Review. Cornell University Press.

Barrett, Katherine, and Richard Greene. 2021. "Equity Budgeting in Cities: Directing Dollars Where They're Needed Most." Route Fifty, February 19, 2021. https://www.route-fifty.com/finance/2021/02/equity-budgeting-cities-directing-dollars-where-theyre-needed-most/172183/

Bernabei, E. (2017). Racial equity: Getting to results. Government Alliance on Race & Equity. https://www.racialequityalliance.org/resources/racial-equity-getting-results/

Brooks, D., Curren, R., Dessou, K., Horne, A., & Mowry, J. (2016). City of Portland racial equity toolkit. City of Portland Office of Equity and Human Rights. https://www.portlandoregon.gov/oehr/article/592297

Chaffin, B. C., Shuster, W. D., Garmestani, A. S., Furio, B., Albro, S. L., Gardiner, M., Spring, M., & Green, O. O. (2016). A tale of two rain gardens: Barriers and bridges to adaptive management of urban stormwater in Cleveland, Ohio. Journal of Environmental Management, 183, 431–441. https://doi.org/10.1016/j.jenvman.2016.06.025

Cilluffo, A., Geiger, A. W., & Fry, R. (2017, July 19). More U.S. households are renting than at any point in 50 years. Pew Research Center. https://www.pewresearch.org/fact-tank/2017/07/19/more-u-s-households-are-renting-than-at-any-point-in-50-years/

City of Cleveland. (2013). Cleveland Climate Action Plan. https://d3n8a8pro7vhmx.cloudfront.net/sustainablecleveland/pages/149/attachments/original/1461798511/Cleveland_Climate_Action_Plan.pdf?1461798511

City of Flint. (2017). Capital Improvement Plan. https://app.box.com/s/2pa0o30mh8j5fqwfpahwj6c4t9vd9s7t

City of Milwaukee Sustainability Plan 2013-2023. (2013). ReFresh Milwaukee.

Clement, D., & Kanai, M. (2015). The Detroit Future City: How Pervasive Neoliberal Urbanism Exacerbates Racialized Spatial Injustice. American Behavioral Scientist, 59(3), 369–385. https://doi.org/10.1177/0002764214550306

Climate Action & Sustainability Plan- 2020 Update. (2020). https://www2.erie.gov/environment/sites/www2.erie.gov.environment/files/uploads/2020_Paris_Annual_Update.pdf

Copp, C., Shankar, P., Bondi-Keenan, & Haas, P. (2018). Assessing Disparities of Urban Flood Risk for Households of Color in Chicago. Center for Neighborhood Technology. https://www.cnt.org/publications/assessing-disparities-of-urban-flood-risk-for-households-of-color-in-chicago

Despart, Z. (n.d.). Harris County voters pass $2.5 billion flood bond one year after Harvey—Houston Chronicle. Retrieved January 20, 2021, from https://www.houstonchronicle.com/news/houston-weather/hurricaneharvey/article/Harris-County-voters-pass-2-5-billion-flood-bond-13182842.php

Detroit Sustainability Office. (2019). Detroit Sustainability Action Agenda 2019. City of Detroit. https://detroitmi.gov/sites/detroitmi.localhost/files/2019-06/Detroit-Sustainability-Action-Agenda-Web.pdf

Detroiters Working for Environmental Justice. (2011). Detroit Climate Action Plan. http://glisa.umich.edu/projects/detroit%E2%80%99s-climate-action-plan

Draus, P., Haase, D., Napieralski, J., Sparks, A., Qureshi, S., & Roddy, J. (2020). Wastelands, Greenways and Gentrification: Introducing a Comparative Framework with a Focus on Detroit, U.S.A. Sustainability, 12(15), 6189. https://doi.org/10.3390/su12156189

Facilitating Power. (2019). The Spectrum of Community Engagement to Ownership. Movement Strategy. https://movementstrategy.org/b/wp-content/uploads/2019/09/Spectrum-2-1-1.pdf

Frank, T. (2020). E&E NEWS ANALYSIS: Flooding disproportionately harms black neighborhoods. ClimateWire, 10(9). https://www.eenews.net/climatewire/stories/1063295449/print

Galloway, G., Reilly, A., Ryoo, S., Reilly, A., Haslam, M., Brody, S., Highfield, W., Gunn, J., Rainey, J., & Parker, S. (2018). The Growing Threat of Urban Flooding: A National Challenge. University of Maryland; Texas A&M University. https://cdr.umd.edu/sites/cdr.umd.edu/files/resource_documents/COMPRESSEDurban-flooding-report-online-compressed-0319.pdf

Gonzalez, I. (2021, March). How to build an equitable approach to resilience: Lessons from Harris County, Texas [American Flood Coalition]. American Flood Coalition Blog. https://floodcoalition.org/2021/03/guest-post-how-to-build-an-equity-centered-approach-to-flood-resilience-lessons-from-harris-county-texas/

Goshen, D. (2020, September 21). Harris County Passes Bylaws for Community Task Force to Create a More Resilient Future. Texas Living Waters Project. https://texaslivingwaters.org/harris-county-passes-bylaws-for-community-task-force-to-create-a-more-resilient-future/

Gould, K. A., & Lewis, T. L. (2017). Green gentrification: Urban sustainability and the struggle for environmental justice. Routledge, Taylor & Francis Group.

Harris County Commissioners Court. (2019). Harris Thrives Resolution. https://files.constantcontact.com/81a41547001/98fd956e-4e6a-4f0e-bd37-f1fbe2a12b72.pdf

Heckert, M., & Rosan, C. D. (2016). Developing a green infrastructure equity index to promote equity planning. Urban Forestry & Urban Greening, 19, 263–270. https://doi.org/10.1016/j.ufug.2015.12.011

Hersher, R. (2020, October 22). Most Tenants Get No Information About Flooding. It Can Cost Them Dearly. National Public Radio. https://www.npr.org/2020/10/22/922270655/most-tenants-get-no-information-about-flooding-it-can-cost-them-dearly

Highsmith, A. R. (2015). Demolition Means Progress: Flint, Michigan, and the Fate of the American Metropolis. University of Chicago Press.

Houston Chronicle's most powerful photos of Hurricane Harvey. (2018, August 22). Houston Chronicle. https://www.houstonchronicle.com/news/houston-weather/hurricaneharvey/article/Houston-Chronicle-s-most-powerful-photos-of-13163714.php

Hughes, S. (2020). Principles, drivers, and policy tools for just climate change adaptation in legacy cities. Environmental Science & Policy, 111, 35–41. https://doi.org/10.1016/j.envsci.2020.05.007

Iacofano, D. S., & Lewis, N. K. (2012). Maximum Feasible Influence: The New Standard for American Public Participation in Planning. Locke Science Publishing Company, Inc., Journal of Architectural and Planning Research(Spring, 2012, Vol. 29, No. 1). http://www.jstor.com/stable/43030958

Immergluck, D., & Balan, T. (2018). Sustainable for whom? Green urban development, environmental gentrification, and the Atlanta Beltline. Urban Geography, 39(4), 546–562. https://doi.org/10.1080/02723638.2017.1360041

Jesdale, B. M., Morello-Frosch, R., & Cushing, L. (2013). The Racial/Ethnic Distribution of Heat Risk–Related Land Cover in Relation to Residential Segregation. Environmental Health Perspectives, 121(7), 811–817. https://doi.org/10.1289/ehp.1205919

Johnson, Melissa, Bashay, Molly, & Bergson-Shilcock, Amanda. (2019). The roadmap for racial equity: An imperative for workforce development advocates. National Skills Coalition. https://www.nationalskillscoalition.org/resources/publications/racial-equity

Jurjonas, M., Seekamp, E., Rivers, L., & Cutts, B. (2020). Uncovering climate (in)justice with an adaptive capacity assessment: A multiple case study in rural coastal North Carolina. Land Use Policy, 94, 104547. https://doi.org/10.1016/j.landusepol.2020.104547

Kennedy, E., Patterson, J., Taylor, K., Steichen, L., Mulhoiiand, M., Franklin, M., & Saseedhar, S. (2019). Our communities, our power: Advancing resistance and resilience in climate change adaptation (P. Sparr, Ed.). National Association for the Advancement of Colored People (NAACP) Environmental & Climate Justice Program. https://live-naacp-site.pantheonsite.io/wp-content/uploads/2019/04/Our-Communities-Our-Power-TOOLKIT-FINAL.pdf

La Rosa, D., & Pappalardo, V. (2020). Planning for spatial equity—A performance based approach for sustainable urban drainage systems. Sustainable Cities and Society, 53, 101885. https://doi.org/10.1016/j.scs.2019.101885

Lõhmus, M., & Balbus, J. (2015). Making green infrastructure healthier infrastructure. Infection Ecology & Epidemiology, 5(1), 30082. https://doi.org/10.3402/iee.v5.30082

Lui, Meizhu, Barbara J. Robles, Betsy Leondar-Wright, Rose M. Brewer, and Rebecca Adamson. 2006. The Color of Wealth: The Story Behind the U.S. Racial Wealth Divide. New York and London: The New Press.

Macha, J. (2019, August 28). Harris County Adopts #HarrisThrives Resolution. Bayou City Waterkeeper. https://bayoucitywaterkeeper.org/harris-thrives-resolution/

Meerow, S., & Newell, J. P. (2017). Spatial planning for multifunctional green infrastructure: Growing resilience in Detroit. Landscape and Urban Planning, 159, 62–75. https://doi.org/10.1016/j.landurbplan.2016.10.005

Meerow, S., Pajouhesh, P., & Miller, T. R. (2019). Social equity in urban resilience planning. Local Environment, 24(9), 793–808. https://doi.org/10.1080/13549839.2019.1645103

Michigan Department of Civil Rights and Gerald R. Ford School of Public Policy. (2018). Racial equity toolkit: A roadmap for government, organizations and communities. https://www.michigan.gov/documents/mdcr/racial_equity_toolkit_web_new4_628923_7.pdf

MMSD. (2019). Milwaukee Metropolitan Sewage Distrct: Resilience Plan 2019. Milwaukee Metropolitan Sewerage District. https://www.freshcoastguardians.com/static/Resilience_Plan_2019_F.pdf

Movement Strategy Center, Movement Generation, The Praxis Project, & Reimagine! RP&E. (2015). Pathways to resilience: Transforming cities in a changing climate. Kresge Foundation. https://movementstrategy.org/b/wp-content/uploads/2016/07/Pathways_2_Resilience_EBook-Full-2015.pdf

Nesbitt, L., Meitner, M. J., Girling, C., Sheppard, S. R. J., & Lu, Y. (2019). Who has access to urban vegetation? A spatial analysis of distributional green equity in 10 U.S. cities. Landscape and Urban Planning, 181, 51–79. https://doi.org/10.1016/j.landurbplan.2018.08.007

One Region Forward. (2015). A New Way to Plan for Buffalo Niagara. http://bap-home.net/solarize/wp-content/uploads/sites/28/2017/05/1RF_A-New-Way-To-Plan-For-Buffalo-Niagara_FinalPlan_reduced.pdf

Oulahen, G., Mortsch, L., Tang, K., & Harford, D. (2015). Unequal Vulnerability to Flood Hazards: "Ground Truthing" a Social Vulnerability Index of Five Municipalities in Metro

Vancouver, Canada. https://doi.org/10.1080/00045608.2015.1012634

Ross, L., Wood, S., Burgy, D., Eley, C., Guerra, M., Howard, T., Ledesma, E., Mitra, A., Ochoa, M., Perkins, A., Stowell, C., & Vazquez, M. (2019). Planning for equity policy guide. American Planning Association. https://planning.org/publications/document/9178541/

Rudolph, L., Harrison, C., Buckley, L., & North, S. (2018). Climate change, health, and equity: A guide for local health departments. Public Health Institute and American Public Health Association.

Shi, L. (2020). From progressive cities to resilient cities: Lessons from history for new debates in equitable adaptation to climate change. Urban Affairs Review, 1078087419910827. https://doi.org/10.1177/1078087419910827

Smith, K. (2019). More and better: Increasing diversity, equity, and inclusion in planning (PAS Memo). American Planning Association. https://www.planning.org/publications/document/9176238/

Solis, M. (2020). Racial Equity in Planning Organizations. Journal of the American Planning Association, 86(3), 297–303. https://doi.org/10.1080/01944363.2020.1742189

Travaline, K., Montalto, F., & Hunold, C. (2015). Deliberative Policy Analysis and Policy-making in Urban Stormwater Management. Journal of Environmental Policy & Planning, 17(5), 691–708. https://doi.org/10.1080/1523908X.2015.1026593

U.S. Census Bureau. (2019). Demographic and housing estimates, 2019 American Community Survey 1-year estimates (No. DP05). U.S. Census Bureau.

U.S. Water Alliance. (2018). An equitable water future: Opportunities for the Great Lakes Region. U.S. Water Alliance. http://uswateralliance.org/sites/uswateralliance.org/files/publications/uswa_greatlakes_021318_FINAL_RGB.PDF

U.S. Water Alliance. (2020). Water Rising: Equitable Approaches to Urban Flooding and Racial Equity. U.S. Water Alliance. http://uswateralliance.org/sites/uswateralliance.org/files/publications/Final_USWA_Water%20Rising_0.pdf

USDN. (2017). Guide to Equitable Community-Driven Climate Preparedness Planning. USDN. https://www.usdn.org/uploads/cms/documents/usdn_guide_to_equitable_community-driven_climate_preparedness-_high_res.pdf

USDN. (2019). Guide to Developing Resilience Hubs. USDN. http://resilience-hub.org/wp-content/uploads/2019/10/USDN_ResilienceHubsGuidance-1.pdf.

Wachter, S., & Gillen, K. (2006). Public Investment Strategies: How They Matter for Neighborhoods in Philadelphia. Wharton School of Business, University of Pennsylvania. https://community-wealth.org/content/public-investment-strategies-how-they-matter-neighborhoods-philadelphia

Yen Liu, Y., & Keleher, T. (2009). Green equity toolkit: Standards and strategies for advancing race, gender and economic equity in the green economy. Race Forward.

2/26/21 9:32:00 AMYuen, T., Yurkovich, E., Grabowski, L., & Altshuler, B. (2017). Guide to equitable, community-driven climate preparedness planning. Urban Sustainability Directors Network. https://www.usdn.org/uploads/cms/documents/usdn_guide_to_equitable_community-driven_climate_preparedness-_high_res.pdf

GRAHAM
SUSTAINABILITY INSTITUTE
UNIVERSITY OF MICHIGAN

ABOUT GRAHAM SUSTAINABILITY INSTITUTE

The Graham Sustainability Institute mobilizes the expertise and passion of scholars, partners, and decision-makers to work together and bring world-class research to real-world sustainability challenges. We focus on climate change, water resources, leadership development, policy integration, and broader impacts, working toward a just and sustainable world where policy and practice are powered by science, collaboration, and creativity.

Our dedication to academic excellence for the public good is inseparable from our commitment to diversity, equity, and inclusion. We believe that diversity is key to empowerment, and to the advancement of sustainability knowledge, learning, and leadership. Our mission includes ensuring that each member of our community thrives.

A Non-discriminatory, Affirmative Action Employer.

REGENTS OF THE UNIVERSITY OF MICHIGAN

Jordan B. Acker, Huntington Woods
Michael J. Behm, Grand Blanc
Mark J. Bernstein, Ann Arbor
Paul W. Brown, Ann Arbor
Sarah Hubbard, Okemos
Denise Ilitch, Bingham Farms
Ron Weiser, Ann Arbor
Katherine E. White, Ann Arbor
Mark S. Schlissel, *ex officio*

Please consider making the more sustainable choice not to print this report.

graham.umich.edu

48491-JUN-2021