Detroit Resilience Hub Framework:

Best Practices for the Implementation of Resilience Hubs in Detroit, Michigan

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LAND ACKNOWLEDGEMENT

We acknowledge that the City of Detroit, as well as the University of Michigan, is located in the traditional homelands of the Anishinaabe, including the Ojibwe (Chippewa), Odawa (Ottawa) and Bodewadomi (Potawatomi) people. From the end of the French and Indian War in 1759 and the following 70 years of disputes over Michigan between the British and United States, many treaties were imposed upon the Michigami Natives beginning the process of stripping them of much of their land and way of life[1]. Research on environmental science and sustainability has benefited and continues to benefit from access to land originally gained through the exploitation of others. Knowing where we live and work does not change the past, but understanding and acknowledging the history, culture, and impacts of colonial practices is an important step towards the creation of an equitable and sustainable future.[2]

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EXECUTIVE SUMMARY

Climate change poses a fundamental threat to plant, animal, and human life. As ever-increasing impacts are felt across the globe, communities face rising stressors such as hotter summers, colder winters, severe flooding, power outages, and decreased food and water supplies. Communities will need to adopt new resilience strategies to best withstand these challenges. A history of systemically racist, destructive policies of urban renewal and post-industrial disinvestment has left much of Detroit's geography and population over-exposed to climate risk.

Resilience Hubs are a relatively new concept that originated in Baltimore, Maryland and have since taken root in communities across the country, leveraging existing community resources and bringing them together into one centralized network (see the Baltimore Case Study on page 33). Resilience Hubs operate at a local level, providing accessibility to residents and facilitating more effective responses in times of crisis, in addition to reducing cost burdens to nonprofits and mutual aid groups.

Table 1: Primary Services of Resilience Hubs:

Trusted central location	A trusted community gathering space in a building or multiple buildings that is accessible to the community.
Resilient energy	Renewable energy from a source such as solar photovoltaic panels or urban wind turbines, further improved by energy storage systems that can withstand outages while reducing greenhouse gas emissions.
Resources during crises	Resources to support the community's needs during extreme events or crises.
Consistent resources during 'normal' periods	Consistent and accessible services to benefit individuals and households and strengthen the community outside of crisis triage and recovery.

Table 2: Examples of Secondary Services of Resilience Hubs:

Job preparedness training	Support for disaster assistance applications
Space for entrepreneurs	Resource storage and distribution
Infrastructural support (i.e., reliable power, refrigeration, access to appliances)	Youth services (i.e., tutoring, sports, volunteering opportunities)

In this report, we outline current and projected climate impacts in Southeast Michigan, historical context for the City of Detroit, the City's unique climate vulnerability, and how the City plans to address climate challenges. Through a literature review and interviews with Resilience Hub practitioners, we assembled a set of 8 essential considerations when establishing a Resilience Hub, listed below. These findings form the foundation of a successful Resilience Hub, though it is essential that each community tailor their approach to address their unique mix of challenges, needs, and assets. This will help EcoWorks, an energy and sustainability focused nonprofit, as they work to establish a Resilience Hub in their own neighborhood on Detroit's West side.

Table 3: Essential Considerations:	
Accessibility	Connectivity
Trust	Capacity Building
Space	Adaptability
Infrastructural Resilience	Environmental Resilience

We engaged the community at neighborhood meetings and a focus group we hosted to include community voices from those who will hopefully benefit from Detroit resilience hubs in the future. Our approach allowed us to tailor this report specifically to EcoWorks' needs. From the literature review and interviews, we created a toolkit for Eco Works to utilize as they connect with the community and build awareness, engagement, and excitement for future hubs.

We explore funding opportunities in both traditional and emerging systems. We explored those findings in this report and summarized them in Appendix D and the one-page 'Summary of Resources' found in Appendix E. While these funding opportunities are not exhaustive, they offer a selection of pathways for funding and convey how novel opportunities to fund community-level work continue to develop. We generate a list of final recommendations for EcoWorks to take next steps toward their own Resilience Hub and to lay groundwork for a network of hubs.

Table 4: Recommendations of Next Steps for Eco Works:	
Engage:	Community Outreach and Trust Building
Pursue:	Creative Funding Streams
Support:	Resilience Hub in Yorkshire Woods
Develop:	Communication Network Between Hubs
Encourage:	Scalable, Adaptable Resilience Programs

GLOSSARY OF TERMS

American Society of Adaptation Professionals (ASAP): A nonprofit professional organization whose mission is to support and connect climate adaptation professionals to advance innovation in the field of practice.[3]

Climate Change: Climate change refers to long-term shifts in temperatures and weather patterns, in particular those driven by human activities since the 1800s such as the burning of fossil fuels and disruption of carbon sinks such as forests and soil layers.[4]

> **Climate Change Mitigation**: A wide array of efforts meant to reduce or prevent emissions of greenhouse gasses.[5]
>
> **Climate Change Adaptation**: Refers to adjustments made to ecological, social, and economic systems in response to actual or expected impacts of climate change.[6]

Climate Vulnerability: "The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity."[7]

> **Exposure:** A measure of the nature and degree to which a system is likely to be impacted by climate change, often a factor of geography - (i.e., neighborhoods within a flood zone are more exposed, but circumstances like homelessness can also increase an individual's exposure).[8]
>
> **Sensitivity:** The degree to which a system is affected, adversely or beneficially, by [climate change]."[9] Sensitivity is influenced by individual characteristics such as old age or low income, as well as systemic characteristics like outdated infrastructure.
>
> **Adaptive Capacity:** The ability of a system (social, economic, ecological) to adjust to climate change, including variability and extremes, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.[10] This term is at times interchangeable with 'resilience'.
>
> **Climate Vulnerability Assessment (CVA)**: "An assessment, often place-based, used to ascertain the susceptibility of a natural or human system to sustaining damage (or in some cases benefiting) from climate change. More so than a typical impact assessment, CVAs consider adaptive management or policy responses that may lessen negative impacts (or enhance positive impacts) of climate change."[11]

Eastside Community Network (ECN): "An organization in East Detroit that develops programs and resources targeting urban climate resilience through policy advocacy, infrastructure development, and community education. ECN promotes climate resiliency and equitable climate change strategies in Detroit that center the needs of east side residents and amplify their voices with respect to the development of their communities."[12]

EcoWorks Detroit: A Detroit based nonprofit with over thirty years' experience providing services at the intersection of community development and sustainability. Their roots are in

energy conservation, but they emphasize all aspects of sustainable development as it relates to building affordable, energy efficient residential housing and commercial buildings.[13]

Eco-D: An initiative in Detroit, founded by EcoWorks, which looks to foster neighborhood-level sustainability by embracing three imperatives — climate protection, equity, and resilience. Eco-D looks to implement community-driven plans that fuel innovative urban regeneration in EcoDistricts across Detroit, including four current communities.[14]

Environmental Justice (EJ): "The idea that all people and communities have the right to equal environmental protection under the law, and to the right to live, work and play in communities that are safe, healthy and free of life-threatening conditions."[15] The US Environmental Protection Agency (EPA) defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[16]

Frontline communities: Communities that experience the "first and worst" consequences of climate change. These communities face a high level of exposure to climate risks because of the location of their communities, the projected climate impacts there, and because of less access to resources, capacity, safety nets, or political power to respond to those risks.[17]

Grassroots: The basic level of society or of an organization especially as viewed in relation to higher or more centralized positions of power.[18]

Intergovernmental Panel on Climate Change (IPCC): "An intergovernmental body of the United Nations created to provide policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options."[19]

Resilience: The capacity to quickly recover from or adjust easily to difficulties or change.[20]

> **Climate Resilience**: "The ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate."[21]

Resilience Hub: "Community-serving facilities augmented to support residents and coordinate resource distribution and services before, during, or after a natural hazard event. They leverage established, trusted, and community-managed facilities that are used year-round as neighborhood centers for community-building activities."[22]

School for Environment and Sustainability (SEAS): An interdisciplinary professional school at the University of Michigan focused on environmental science, environmental justice, and environmental policy.[23]

Solar + Storage: The integration of a battery with solar energy so as to store excess solar power for future use when there is little or no sunlight, charges are high in peak demand times, or during grid failures.[24]

INTRODUCTION

The current and future hazards of climate change are unevenly distributed across geography and socioeconomic status.[25] In frontline communities, neighborhood and municipal level resilience initiatives offer a pathway to prepare for future risks, as well as a way of confronting past injustices. Resilience hubs are a concept that have garnered recent attention for their potential to bring climate resilience efforts to the hyper-local, grassroots level.[26] For the purposes of this report, we define a resilience hub as a community-serving facility housed in a trusted local physical space that offers support and resources before, during, and after disturbances. They also offer regular community-serving resources, services, or activities on a day-to-day basis outside of times of disturbance or crisis that strengthen their community.

A history of systemically racist, destructive policies of urban renewal and post-industrial disinvestment has left much of Detroit's geography and population over-exposed to climate risk.[27] [28]As an organizational framework, resilience hubs provide a potential model for channeling existing community action and resources towards building resolve and strength in the face of climate injustice.

EcoWorks Detroit is an environmental sustainability nonprofit based on the west side of Detroit. Our partnership with them began in early 2021 when we were matched as a part of the University of Michigan School for Environment and Sustainability (UM-SEAS) master's capstone program. EcoWorks approached us with the idea of implementing a resilience hub based out of their facilities in the Evergreen Lahser neighborhood on the West side of Detroit. Through discussion with EcoWorks, we set a few distinct goals for our project:

- Research the potential role of resilience hubs in Detroit, as well as the specific opportunities for the neighborhoods surrounding EcoWorks' newly renovated facility
- Compile a set of best practices, recommendations, and potential funding opportunities for EcoWorks to use in pursuing implementation of their own resilience hub
- Develop resources for EcoWorks to use for engagement with community members and stakeholders on the topic of resilience hubs

Over the past year, we have worked in consultation with EcoWorks towards these goals. We met regularly with EcoWorks staff as well as University of Michigan advisers to refine and shape these goals. We conducted interviews with resilience hub practitioners in other cities, as well as one resilience hub already operating in Detroit. We met with the Director of Sustainability for the City of Detroit and engaged with communities where EcoWorks already works to gauge interest in and ideas for resilience hubs. The final product is this framework report and its attached materials, including a toolkit, a brochure, and an EcoWorks mailer. While the primary audience for this report is EcoWorks and their partners, it has been written to be broadly applicable where appropriate for other stakeholders EcoWorks would like to share it with. The intent is for any community organization, official, or resident in the City of Detroit to be able to use the contents of this report to advance the development of resilience hubs for their neighborhoods.

BACKGROUND INFORMATION

Historical Context: The City of Detroit

Detroit is a city rich in history and culture as well as a long history of environmental inequity, exacerbating Detroit's need for environmental resilience in the face of the climate crisis. Detroiters have been directly impacted by municipal and state policy on housing, zoning, and redlining.[29] The overall health of Detroiters has greatly suffered from the effects of these policies. Consequently, Detroit, the largest majority-African American city in the US, has extremely high rates of childhood lead poisoning, asthma, and infant and maternal mortality.[30] Beginning in 2016 the Asthma Collaborative of Detroit (ACD) began leading efforts to address Detroit's high asthma burden[31] which from 2017 to 2019, the asthma rates among Detroit residents were 46% higher than those of Michigan residents overall.[32]

A combination of depopulation, White flight, and the collapse of the city's automotive manufacturing industry has left behind vulnerable Detroit communities. The expansion of suburban sprawl in the 1950s and 60s presented a refuge to White people who wanted to distance themselves from Black people in the years following the Great Migration.[33] Consequently, some parts of Detroit were abandoned due to racism and discrimination, contributing to the expansion of the suburban sprawl. Three of the major sources of conflict between the races were housing, transportation, and education. The continual decades of urban unrest in Detroit can be attributed to "a multitude of political, economic, and social factors including police abuse, lack of affordable housing, urban renewal projects, economic inequality, and rapid demographic change."[34] The 1967 Detroit Race Rebellion brought to the forefront the everyday struggles with police violence faced by many Black Detroiters, but also exacerbated the shift of resources from the City of Detroit to the surrounding suburbs furthering the expansion of the suburban sprawl.

Zip codes in Michigan with high concentrations of people of color, poverty levels, and other indicators of social disadvantage bear the greatest pollution-related burdens. As of 2021, Detroit has a 33% poverty rate and 20% unemployment rate.[35] [36]The 48217 zip code has been coined "the most polluted zip code in Michigan" and is in Southwest Detroit. They have alarmingly high air, water, and land pollutants, which has led to some of the highest asthma and cancer rates in the state of Michigan.[37] [3839] In and around Southwest Detroit, there are more than two dozen pollutant-producing facilities owned by several companies all on the EPA's watch list, including Marathon who in 2016 was fined for violations.[40]

Southwest Detroit's Marathon refinery has been one of the most problematic local polluters for neighboring communities. The refinery emits sulfur dioxide as well as particulate matter and these emissions have long been a concern for residents.[41] The greenhouse gas sulfur dioxide is a toxic driver of asthma and other respiratory afflictions. Some of the side effects of this gas are sneezing, sore throat, wheezing, shortness of breath, and chest tightness. People breathing in sulfur dioxide feel its effects after just five minutes of exposure and it can create sulfuric acid in the body, even causing "sunburns on your lungs".[42]

Additionally, there has been little effective State oversight of Michigan's major utilities for decades. Over time, utility cost burdens have shifted from Michigan's industrial consumers to its residential consumers. And as a result, Detroit residents pay some of the highest utility rates in the country while experiencing some of the worst service, in terms of interruptions.[43] Additionally, high water and utility bills have contributed significantly to Detroit's housing challenges in recent years. In 2014, Detroit implemented a harmful debt collection program and shut off the water to more than 140,000 households, 95% of which belonged to Black customers.[44] As a result of this city-made water crisis, many are concerned about the possibility of an increase in illness and other public health concerns related to a lack of access to clean water. To be considered affordable, water bills can be no more than 2.4-4.5% of household income; in Detroit, water bills average 10% of income in households living below the poverty line.[45] Those struggling to pay their water bills in Detroit are further burdened by the fact that water bill debts are rolled into unpaid property taxes, so those who cannot pay for their water bill are also at risk of losing their homes to tax foreclosures. In 2014 when Detroit was undergoing bankruptcy, "some 40,000 residents faced shutoff at the time. As a result, one in six homes in Detroit did not have running water" in 2017.[46]

Climate Impacts in Detroit, Michigan

Detroit, like most cities, is facing a "new normal" because of climate change. Global climate change is caused in great part by the burning of fossil fuels, an activity that also contributes to localized air quality problems experienced in Detroit.[47] In the last decade, Detroit has seen multiple "500-year" flood events, major precipitation changes, unseasonal temperature variation, extreme heat, and extreme cold. Health effects from these events include respiratory problems stemming from mold growth, tetanus, heat stroke, heart conditions and hypothermia to name a few.[4849] Since 2010, Detroit has experienced six of its 10 hottest summers on record, with summer 2021 bringing 13 days with temperatures over 90 F.[50] Higher heat will contribute to heat-related illness and death, exacerbate asthma, and increase the total number of people with asthma and other respiratory illnesses stemming from air quality. Over the next century, the city is projected to experience increased average temperature, a higher incidence of heat waves, more frequent and severe rainstorms, increased flood risk with risk of sewage overflow and water contamination, reduced air quality, and more stress on infrastructure.[51]

Detroit uses a combined sewer system with a single drainage network that transports stormwater drainage alongside waste from businesses, industries, and residences.[52] When the system is overwhelmed, such as during heavy precipitation events, combined sewage is released into the Detroit and Rouge Rivers. Southeast Michigan, including Detroit, is anticipated to experience an increase in multi-day and heavy precipitation in coming decades due to climate change. The City currently experiences mild and nuisance flooding due to impervious surfaces and poorly directed stormwater. This is exacerbated by severe thunderstorms which can cause inland flooding that affects residential areas, businesses, and transit corridors. The Jefferson Chalmers neighborhood near the Detroit River experienced severe flooding in 2014, 2016, and 2021 and 96% of properties in the neighborhood are at an extreme risk of flooding in the future.[53] [54] After the most recent flood event in June 2021, Detroit Mayor Mike Duggan claimed it was a climate change and

stormwater capacity problem, rather than an issue of stormwater maintenance, saying "there is not a community in America that sizes their stormwater system to be able to handle as much rain in one day as you'd have in two months."[55] Communities are fed up, having dealt with flooded car engines, businesses, basements, and permanent damage.

A city or population's vulnerability to climate change is a combination of exposure to impacts, sensitivity, and adaptive capacity. Some communities are more sensitive to the challenges posed by a changing climate. Communities in low-income urban areas, elderly populations, and children are more likely to experience adverse health outcomes due to the rise in global temperature that can cause heat stroke, reduced air quality, and higher incidences of asthma. For example, Detroit's adult community has a 29% higher rate of asthma diagnosis than Michigan as a whole. Communities with fewer resources and higher vulnerability are also the least likely to be able to evacuate during a crisis and lack the funds to rebuild damaged homes. In Detroit, 36.4% of the population lives in poverty compared to the national average of 14%.[56]

Urban areas like Detroit, experience the urban heat island effect, where dark street surfaces, building structures and materials retain heat and can raise the average temperature by 1-3 °C higher than rural areas. Areas that lack tree canopy for shade or other greenspace experience a more intense heat island effect.[57] A study by Climate Central examined five main components of temperature including albedo, percentage of greenery, population density, building height, average width of streets, and irregularity of the city. The study gave Detroit a heat index score of 6.97, representing how many degrees Fahrenheit warmer it is than its less developed surroundings. Detroit had the 16th highest heat island intensity of the 159 cities included in the study.[5859]

Not only does Detroit suffer from aforementioned climate and health risks, but also the strategic placement of manufacturing and polluting activities in low-income neighborhoods, particularly through the practice of redlining, in Black and Brown communities. Reviewing the MIEJScreen tool, seen in Figure 1, that scores the relative environmental risk factors for communities based on various environmental, health and socioeconomic indicators. These numbers highlight the disparities amongst communities that may contribute to additional environmental risks. The highest EJ scores coincided with large concentrations of minority

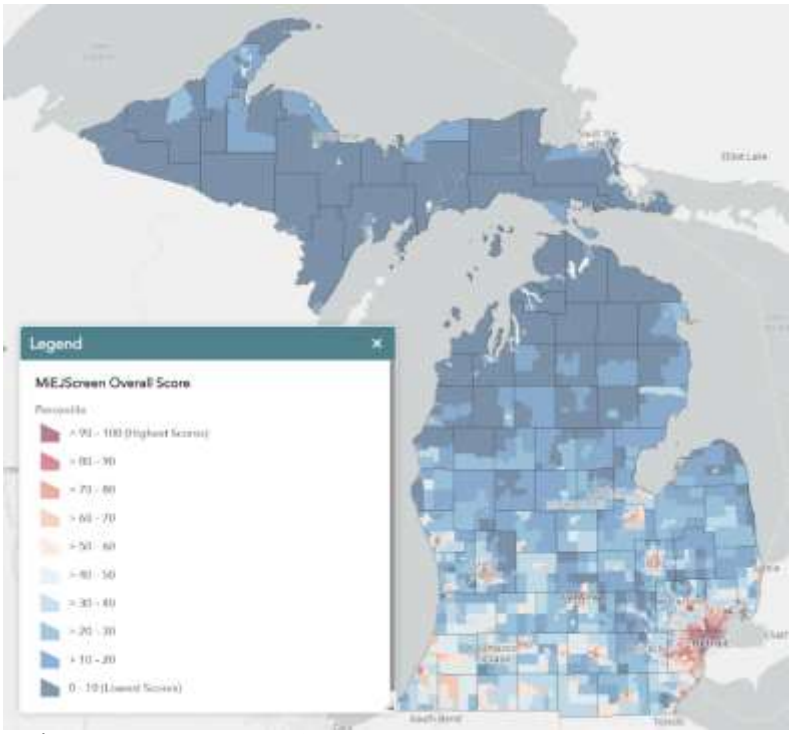

Figure 1. EGLE's Michigan EJ Screen.[54]

residents, high levels of poverty, unemployment, low educational attainment, and overall social disadvantage, coupled with highest concentration of environmental risks including high cancer risk, elevated air pollution, high traffic patterns and large numbers of hazardous waste facilities, including a high number of federally designated superfund cleanup sites. And the highest scores were found clustered around urban areas, with the largest cluster in and around Detroit.[60]

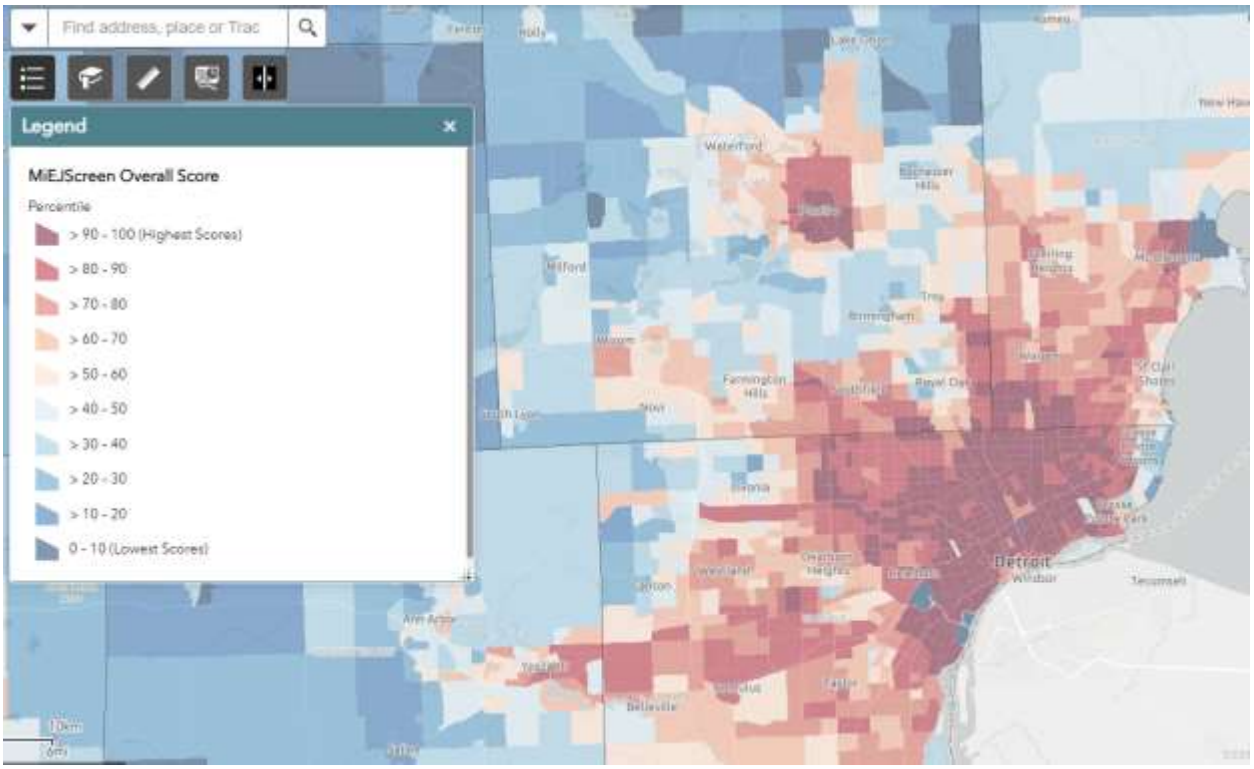

Figure 2. EGLE's Michigan EJ Screen.[61]

Climate Action in Detroit

The City of Detroit developed its Sustainability Action Agenda in 2019, utilizing a variety of community outreach strategies to understand the vision for sustainability within various swaths of the Detroit community. This involved hiring Sustainability Ambassadors who spoke directly with neighbors in their communities, an Interdepartmental Working Group with 29 City departments, a digital platform to keep residents informed, online and in-person surveys in five languages, Town Hall meetings, focus groups with underrepresented populations, and attendance at over 100 community meetings.[62] The outcome was 43 action items to address 10 goals with four overarching desired outcomes. The full summary of the Framework can be found in Appendix A, but the most relevant outcomes and actions that could be addressed through varying initiatives through resilience hubs are included below in Table 5.

Table 5: Relevant Sustainability Action Agenda Action Items[63]
Outcome 1: Healthy, Thriving People
1. Provide nutrition and environmental education at recreation centers and parks.
5. Expand sports recreation opportunities for youth.
8. Increase tree plantings in vulnerable areas.
10. Expand green jobs training and workforce development programs.
11. Prepare Detroit residents for City employment opportunities.
Outcome 2: Affordable, Quality Homes
15. Improve access to utility efficiency programs.
16. Expand home plumbing repair programs.
19. Increase access to information on existing affordable housing.
Outcome 3: Clean, Connected Neighborhoods
24. Support neighborhood-based efforts to care for vacant lots and structures.
26. Launch a citywide recycling campaign.
30. Launch residential composting pilot program.
31. Improve mobility connections between neighborhoods and job centers.
Outcome 4: Equitable, Green City
34. Create neighborhood scale, distributed green infrastructure projects.
36. Integrate climate change impacts into hazard mitigation planning.
37. Improve resident access to sustainability-related City services.
38. Expand emergency preparedness and communication tools.

SETTING THE STAGE: VULNERABILITY & RESILIENCE

While climate change is a global phenomenon and its impacts will be felt by the entire planet, some communities stand to bear the worst effects of increases in extreme weather and other environmental hazards. As we work towards resilience, it is important to consider which people and places are most vulnerable. Understanding these factors will allow policymakers, advocates, and community leaders to target resilience investments where they will be most impactful.

> *"Without effective, locally driven adaptation, there will be a very serious consequences for [low- and middle- income communities] and for national economies." Satterthwaite, et al.*[64]

The way climate specialists talk about vulnerability has evolved over the years, but most agree that there are three key components to understanding what makes something or someone vulnerable: exposure, sensitivity, and adaptive capacity.[65]

Exposure is the degree to which a system experiences stressors from climate change.[66] Exposure is often a factor of geography and the environment. For example, neighborhoods within a flood zone are more exposed, but circumstances like homelessness can also increase an individual's exposure.

Sensitivity is the extent to which a system is affected by disruptions from climate change.[67] Sensitivity is broadly determined by social characteristics like age, income, and disability; however, certain environmental qualities - like the condition of infrastructure - can also affect sensitivity.

Adaptive capacity is the ability of a system to absorb or accommodate disruptions from climate hazards.[68] Adaptive capacity is enhanced by structural assets, such as administrative redundancy and emergency response infrastructure, as well as social assets, like community goodwill and strong interpersonal networks.

The term 'adaptive capacity' is often considered to be interchangeable with 'resilience'. That said, 'resilience' usually has broader connotations, and is frequently applied in various contexts. To understand resilience hubs, it is necessary to grasp what resilience means in a community context.

Resilient Communities

What is resilience and why is it important? For this project, we define community resilience as a community's sustained ability to withstand, adapt, respond, and quickly recover in the face of adversity and damage in times of crisis. We are specifically interested in building resilience to stressors caused by climate change and exacerbated by existing systems and social structures. Relevant systems range from physical infrastructure such as transportation, food distribution,

and utility structures, to governance and financial structures that interfere with or obstruct community resilience efforts.

Resilience is improved or maintained in urban environments through stormwater infrastructure, community solar, well-maintained buildings, and versatile green spaces. This can also include proper risk assessment to reduce building in floodplains or requirements for buildings to include climate resilient materials and work towards highly efficient buildings with the aim to reduce the burden of utility costs.[69] This is especially important in places like Detroit, where costs to upgrade to energy efficient items such as lighting from incandescent to LED was 2 times higher in high-poverty areas.[70] Communities in Detroit with lower average socioeconomic status were found to have higher energy use per capita due to inefficient homes and generally higher billing connected to aging and underfunded infrastructure, than those of higher socioeconomic status.[71]

Efforts to build community resilience can lead to diverse benefits such as reduced utility bills, higher community engagement, and stronger support networks for basic needs and resources. The spirit of engaged community-level work is often seen in block groups or community associations such as Southwest Detroit, North Rosedale Park Civic Association (NRPCA), Regent Park Community Association (RPCA), Warrendale Community Organization (WCO), or Hubbard-Richard Resident Association (HRRA). As seen through these Detroit based community-based organizations (CBO), resilient communities are the ones that come together to support each other before, during, and after a crisis.

"To work on engaging the entire community… inclusivity and good communication need to be prioritized. Emphasizing those qualities can also help to create a more resilient organization." - HRRA President Sam Butler[72]

Table 6: Potential Benefits of Resiliency-Building Efforts

Reduced Utility Bills	Community Engagement	Support Network
Government assistance support	Equal cost distributions for goods	Reduced/ manageable temperatures
Food distribution	Accessible transportation	Accessible health assistance
Job readiness	Energy efficient buildings	
Cleaner neighborhoods	High Long term tenant levels	Outdoor recreational access
Structurally sounds homes	Higher air quality	Higher water quality

The concept of community resilience is not new, and those who are referred to as "marginalized" or "vulnerable" by academics or nonprofits are often perfectly aware of what their community needs. Due to economic and governmental barriers to access to funding and resources, marginalized communities have been left behind or out in the past, which has put them at the forefront of global climate change impacts. These past policies and practices have developed a generalized distrust of the government and its ability to support fundamental needs of the community let alone to react and assist during times of crisis. The concept of the 'resilience hub'

has grown out of this need to shift power to adapt into the hands of the community.[73] Resilience hubs seek to enhance and improve local sustainability and resilience through a bottom-up approach that is centered on community co-development and leadership.[74]

RESILIENCE HUBS: THE CURRENT LANDSCAPE

Overview of Resilience Hubs

A concept formally developed by the Urban Sustainability Directors Network's (USDN), resilience hubs are community-serving facilities that are enhanced to support residents and coordinate resource distribution and services before, during, or after a disturbance.[75] These hubs operate from established, trusted, and locally managed buildings that are accessible to the communities they serve. Resilience hubs are also used year-round, outside of disturbances, as community centers for day-to-day activities and resources that build community ties. In addition to reducing the burden on local emergency response teams and bolstering health improvement initiatives, hubs can facilitate community cohesion and improve the effectiveness of community-focused institutions and programs.[76]

Because these hubs are meant to directly impact the community, there are many ways that resilience hubs can manifest themselves. The structure of a resilience hub is important but only as far as its ability to better serve and better resource the community. A resilience hub could be a small grassroots collective that serves a 10-block radius or a network of standalone buildings that serve an entire city. It is important that while resilience hubs are conceptualized by grassroot nonprofits, large nonprofits, or municipal actors, that they do not erase the accomplishments or importance of current resource centers. There is an opportunity to seek to understand and collaborate with a community's existing support structures. Because there is fluidity in the needs of any community, there must be fluidity in the structure of resilience hubs. Our research has found primary services that are in line with traditional USDN definition of a resilience hub and secondary services that can be developed based on community needs and input.

Table 7: Primary Services of Resilience Hubs:[77]

Trusted central location	A trusted community gathering space in a building or multiple buildings that is accessible to the community.
Resilient energy	Renewable energy from a source such as solar photovoltaic panels or urban wind turbines, further improved by energy storage systems that can withstand outages while reducing greenhouse gas emissions.
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Table 2: Examples of Secondary Services of Resilience Hubs:	
Job preparedness training	Support for disaster assistance applications
Space for entrepreneurs	Resource storage and distribution
Infrastructural support (i.e., reliable power, refrigeration, access to appliances)	Youth services (i.e., tutoring, sports, volunteering opportunities)

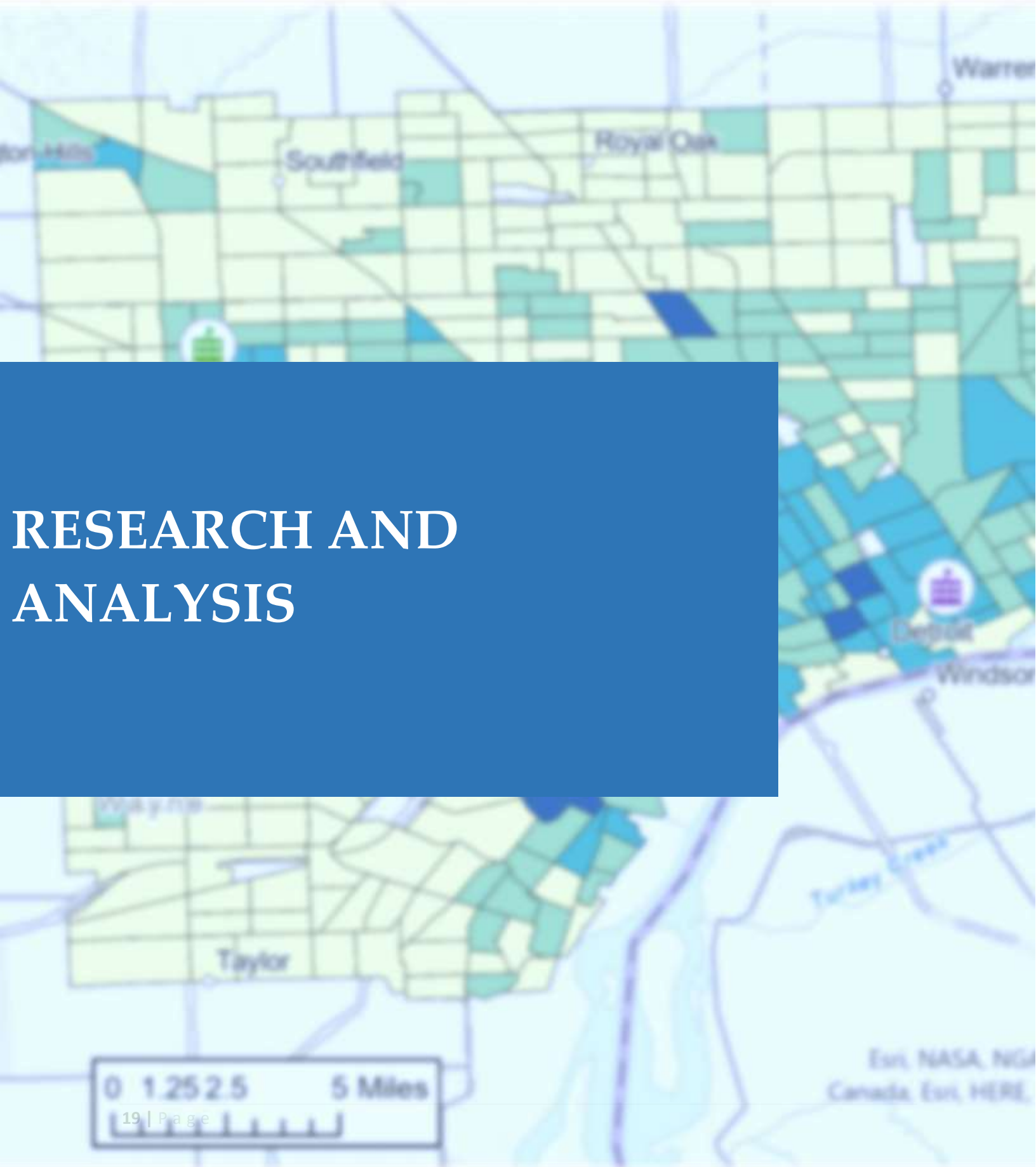
Based on our literature review and interviews detailed later in this report, we have outlined the essential stages to developing a resilience hub below. Community engagement is key at all stages. It is named in Stage 1 but is also especially important in Stage 6. Without thoroughly understanding the communities needs, the resilience hub will be ineffective at supporting them during normal and crisis times.

1. **Engage the community**. Build trust in the organization operating the hub, create understanding of the purpose and services of a resilience hub, and begin idea sharing for the hub's goals.
2. **Pursue funding streams -** We detail both traditional and emerging funding streams later in this report. Look into all available local, state, and federal options for government funding as well as private and novel options, detailed in our emerging opportunities section later in this report.
3. **Establish governance for the hub**. This includes understanding the ownership of the property, the level of involvement of each actor supporting the hub and planning for logistics and a level of operations during various disturbance events. A key component here is understanding the level of involvement of local and City governments.
4. **Define physical location and service area** - Determine the best location for the hub to be housed, the accessibility to the community, and how to define the boundaries of the community it serves.
5. **Pursue a Resilience Hub Network** - Get in contact with existing hubs in the area if possible or connect with hubs with similar goals in different areas to build resource and information sharing networks.
6. **Build customized services** - Engage the community through focus groups, interviews with community leaders, pre-existing community events, and surveys to better understand the most beneficial and realistic type and scope of secondary services the hub can offer.

Resilience hubs, unlike other community centers, are specifically designed to be able to support and triage community members during events of distress and disturbance. These hubs are designed to address and anticipate the specific environmental hazards that the surrounding community face. For example, in the event of power loss, a resilience hub could be a place to gather with readily available renewable power stored for the surrounding community to use. In the case of flooding, a resilience hub could have water removal equipment, FEMA resources, volunteers to help once the water recedes and anything else community members would need to properly respond. Additionally, a resilience hub could also offer food, water, Wi-Fi, and weekly programming for children and seniors. Below in Table 8, we have included a list of considerations

as part of the methodology of establishing resilience hubs, to supplement the stages defined above.

Table 8: Considerations for Resilience Hub Methodologies
Community Desire and Support
There must be a desire for the presence of resilience hubs among community members for resilience hubs to be truly impactful. That desire is fostered through deep and well-maintained community relationships.
Hubs are inherently intersectional as they require collaboration amongst many disciplines and departments to tackle racial equity, climate resilience and greenhouse gas mitigation.
The Building(s)
Strengthening the resilience of the facility to ensure that it meets operational goals in all conditions.
Ensuring the ability to communicate within and outside the service area year-round and especially during disruptions and throughout recovery.
Community Uses
Consider communities social, economic and physical needs in normal/everyday mode
Offering additional services and programs that build relationships, promote community preparedness, and improve residents' health and well-being.
Resources to Meet Community Needs During Extreme Events
Ensuring personnel and processes are in place to operate the facility in all three modes
Proactive and Anticipatory in community needs during the impending climate disruptions
Holistic approach to solving/ supporting the community's needs.
Energy Systems
Ensuring reliable backup power on-site during a hazard while also improving the cost-effectiveness and sustainability of operations in all three operating modes.



RESEARCH AND ANALYSIS

We entered the research phase of this project with the following goals in mind:

- Explore potential of EcoWorks hub that makes use of their newly renovated offices
- Compile best practices and potential challenges
- Solicit community feedback on potential hub activities and programs
- Seek novel funding opportunities and grant seeking recommendations
- Develop tools for promoting and engaging with community around resilience hubs

We needed to develop a framework report that would outline the methodology for identifying and implementing resilience hubs in Detroit, including best practices taken from existing hubs across the US and potential funding avenues. In addition to the main report, we were tasked with developing maps of spatial data using GIS that supported the strategic placement of hubs based on social and climate vulnerability metrics. We also chose to provide community engagement materials for outward facing community engagement around the development of hubs for use by EcoWorks or to be re-tooled by other potential resilience hub operators.

CURRENT NEIGHBORHOOD CONTEXT

In recent years, climate vulnerability assessments (CVAs) have become a popular tool among planners seeking to better understand how climate change will affect a given region and prioritize adaptation measures. CVAs are typically generated by compiling spatial data across different variables and displaying them visually on a map. The final product helps to highlight areas of concern that are most vulnerable to the effects of climate change, as well as those that are relatively safe. The variables that planners use to assess vulnerability can depend on the region, on the nature of the project or plan they are working on, and often on data availability.

In this section, we take a brief look at the City of Detroit and some of its surrounding areas through the lens of a CVA to get a better idea of what neighborhoods are most vulnerable to the effects of climate change - specifically, those effects that a resilience hub can address. The following maps are intended to help visualize what areas of Detroit are most in need of additional adaptive capacity, and should be used to complement local knowledge, not replace it. Our goal in generating these visualizations is to help facilitate targeted planning for resilience efforts, as well as to help make the case for those efforts to relevant stakeholders, officials, and potential funders.

Mapping sensitivity

The following maps were produced using data at the census tract level from the 2019 American Communities Survey and the 2020 United States Census. These maps provide insight into which parts of Detroit and nearby municipalities have high or low levels of sensitivity to the impacts of climate change, relative to the rest of the city. Each map is a window into a different aspect of climate sensitivity across the city.

The maps also include the locations of currently existing or developing resilience hub sites, plus the location of EcoWorks. The names and locations of these hubs can be found in Appendix B. This is to help illustrate which neighborhoods are currently being served by hubs alongside data on which neighborhoods are vulnerable, while providing the same insight for a potential EcoWorks-based hub.

Figure 4 - Median Household Income

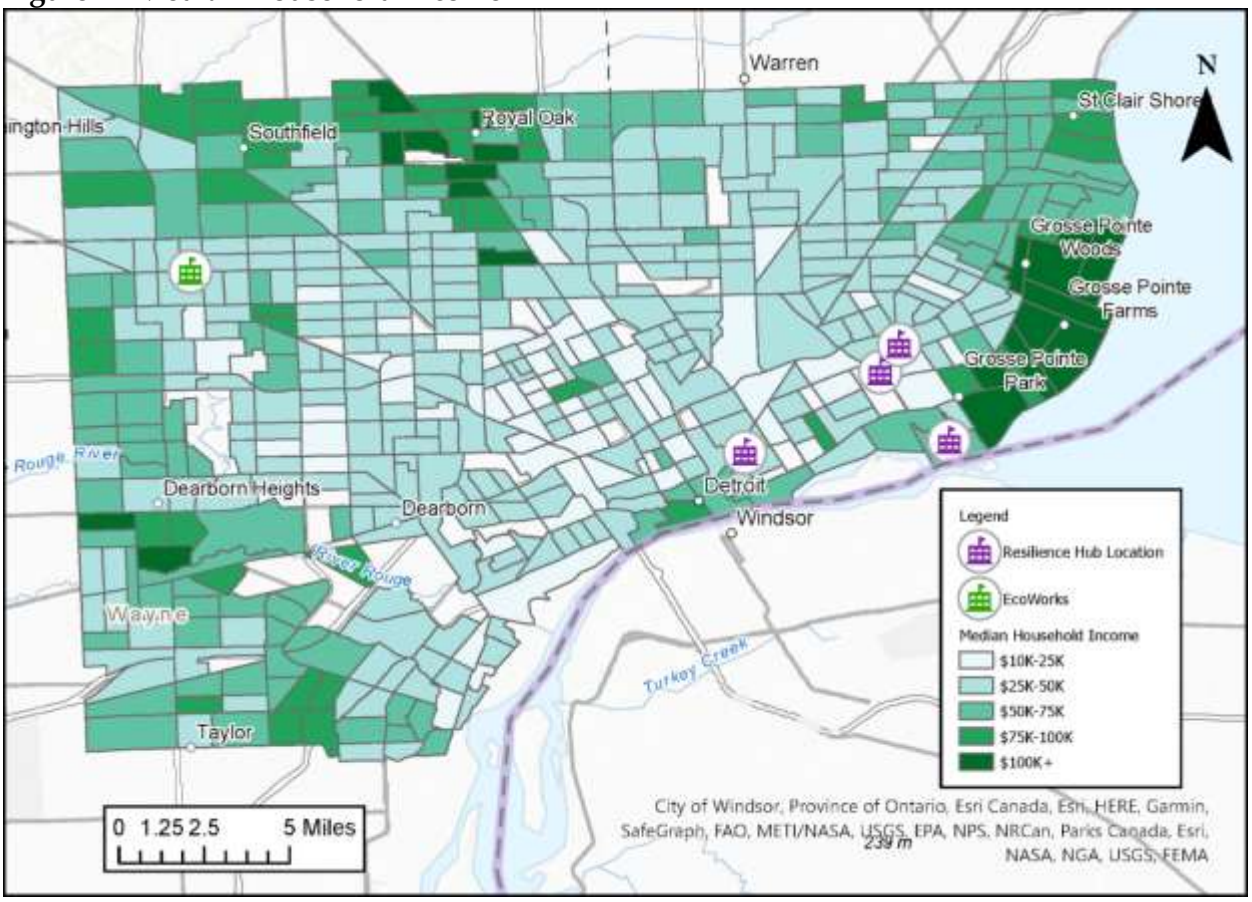


Figure 4 shows the median household income by census tract in metropolitan Detroit Data retrieved from: The U.S. Census Bureau, ESRI[78]

Income is a primary indicator of climate sensitivity, and vulnerability in general.[79] Individuals with disposable income can often "sit out" of extreme weather events - they either live in less-exposed areas to begin with or can afford to physically relocate to higher ground during dangerous storms. A lower income usually means less capacity for major disruptions to everyday life, financial or otherwise. For example, it is much more difficult for a poor family to recover from a major flood on their property - repairs and temporary living arrangements become prohibitively expensive very quickly.[80]

Similarly, the costs of utilities and air conditioning can mean that many low-income households are extremely sensitive to heatwaves, when staying cool during such periods is critical to preventing heat stroke and other common health problems.[81]

Figure 4 illustrates what has been described elsewhere in this report - decades of disinvestment, racist policies, and austerity have left large swaths of the urban core of Detroit in poverty.[82] Higher-income suburbs form a 'ring' around the concentration of very low incomes in Detroit proper. Here we can see that the currently existing or planned resilience hubs do mostly serve areas in Eastside Detroit with very low household incomes - several of the nearby census tracts fall in the 'under $25,000/year' bracket - but there are wide expanses of the city that are left unattended by those hubs. Were EcoWorks to establish a hub, it would certainly be filling a gap on Detroit's west side, where a significant portion of tracts land in the 'under $50,000/year' range.

Figure 5 - Residents over the age of 65 by census tract

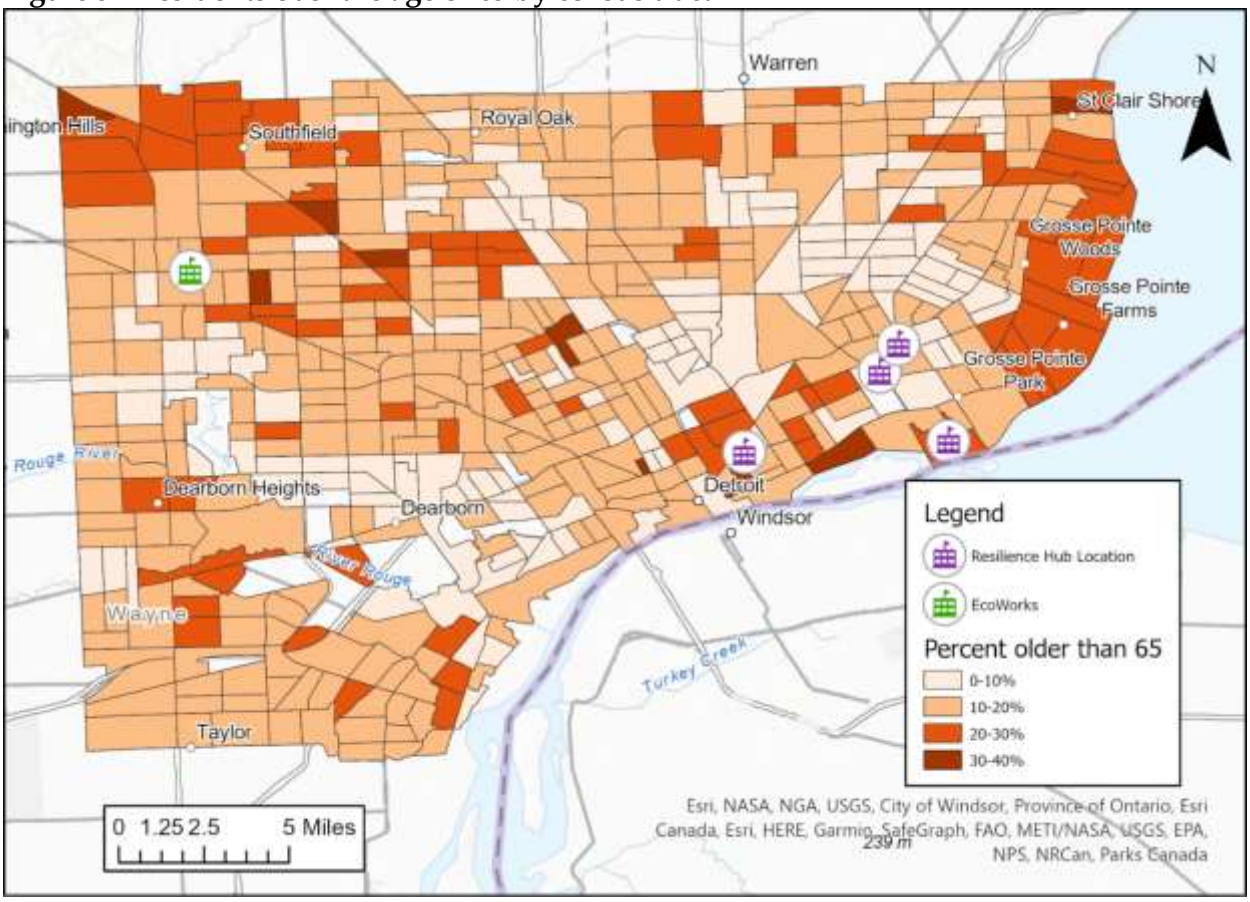


Figure 5 shows the percentage of residents that are over the age of 65, across metropolitan Detroit census tracts. Data retrieved from: The U.S. Census Bureau, Esri[83]

As noted above, age is an important factor in determining sensitivity to climate hazards. Seniors have a heightened sensitivity to environmental conditions for several reasons. In old age, humans become more frail, more susceptible to illness and heat stroke, and less mobile. These characteristics make heat waves and floods much more dangerous for the elderly; they also make it much harder to seek relief from hazards when they are present.[84] Many elderly residents have

well-established support systems - especially those with high incomes, who can afford good elder care and to live in less-exposed homes. Due to this dynamic, it is useful to compare this map with the previous one measuring median household income.

Figure 5 shows a relatively even distribution of people over the age of 65 throughout the city and its surrounding areas. People over 65 make up roughly 10-20% of the population of most census tracts, with some clustering in Grosse Pointe and around Southfield. By comparing these areas with the map of household incomes in figure 4, we can see that both Grosse Pointe and Southfield have relatively high incomes compared to the rest of the region, and especially Grosse Pointe. It seems plausible that the higher incomes in these areas would help mitigate the increased sensitivity those elderly residents might have.

Apart from these two clusters, other parts of Detroit do not stand out as having high concentrations of elderly people; however, making these observations at the level of the census tract gives a relatively coarse sense of the reality at the neighborhood level, and community members with local knowledge may provide better insight into what parts of the city have sensitive elderly populations.

Figure 6 - Proportion of households with children that are single parent households by census tract

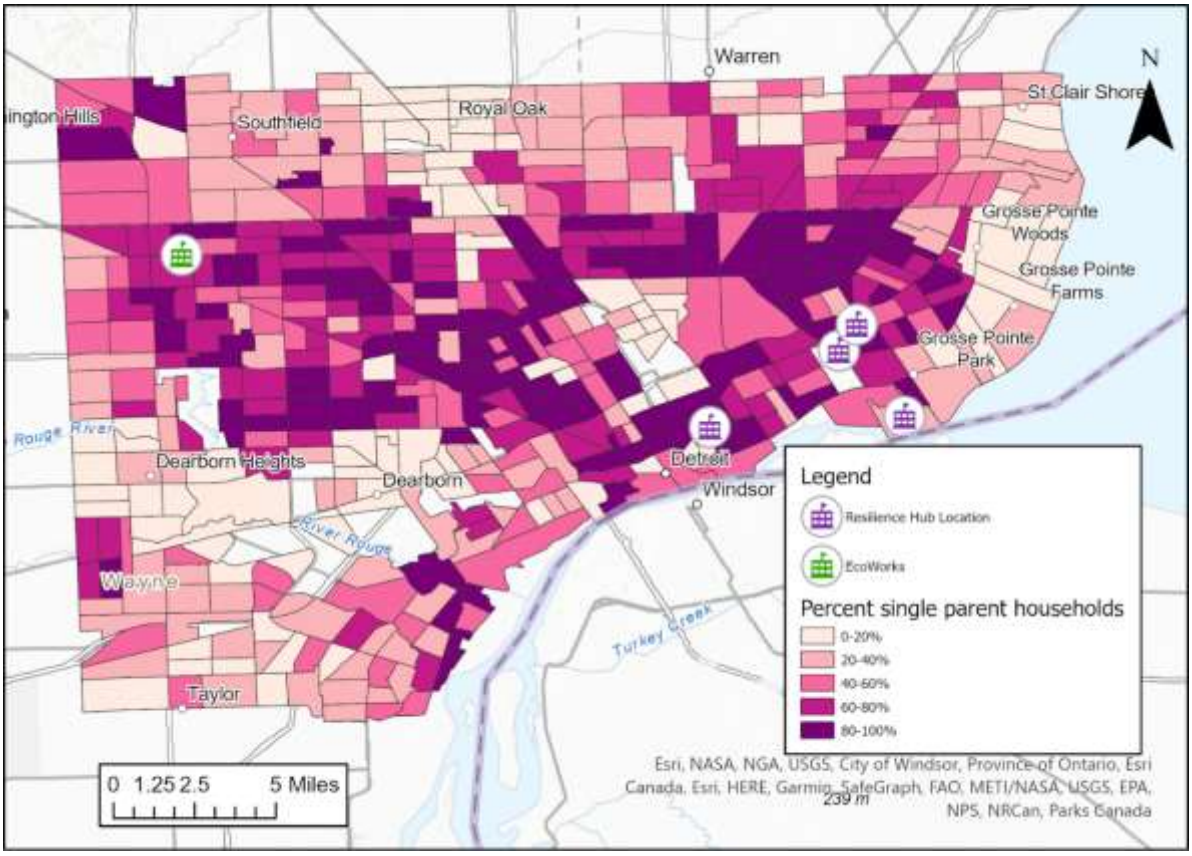


Figure 6 shows the percentage of child-rearing households that are only occupied by a single parent, across metropolitan Detroit census tracts. Data retrieved from: The U.S. Census Bureau, Esri[85]

Just as seniors are more susceptible to harm from climate hazards, children are sensitive for many of the same health and mobility-related reasons.[86] However, kids often have a safety net - their parents. Single parent households face increased stress from climate hazards relative to households with both parents present for the simple reason that a single adult has a more limited capacity for childcare than two adults.

This map reiterates the findings from the previous two maps, while making the full picture more troubling. Many of the tracts with high concentrations of single parent households are also tracts that fall in the bottom two household income brackets from figure 4. This is no surprise - single parent households typically have only one major stream of income - but it indicates that many households in low-income tracts have low incomes on top of another major stressor. As with the previous maps, EcoWorks is in a part of Detroit where a resilience hub might make a difference - a majority of child rearing households in nearby tracts are single-parent.

Figure 7 - Households without access to a personal vehicle by census tract

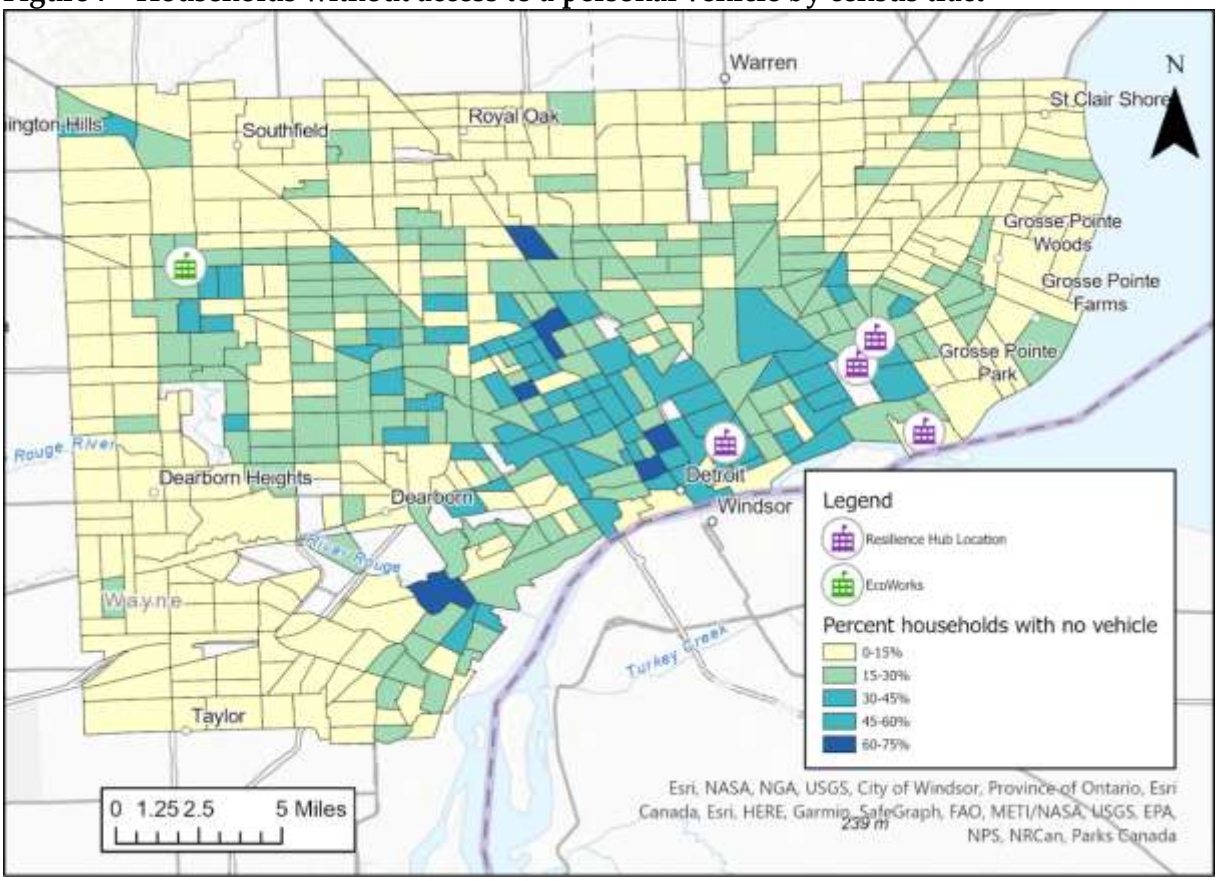


Figure 7 shows the percentage of households without access to a personal vehicle for each census tract. Data retrieved from: The U.S. Census Bureau, Esri[87]

Members of a household with no vehicles have their mobility restricted to areas that are within walking distance or accessible via transit. In a city like Detroit, which has a sprawling urban

landscape and an underfunded public transportation system, not having access to a vehicle is a serious limitation.[88] [89] Personal vehicles give individuals the ability to reach resources and services that are located outside of their immediate neighborhood. This can be critical during a heat wave when some households may need to access a cooling center across town, or during a major storm that knocks out utility lines and causes localized power outages. In these types of situations, households without vehicles are highly sensitive, while those with vehicle access are able to exercise some level of adaptive capacity by relocating temporarily.

Figure 7 tells a similar story to the maps before it, albeit less extreme. The urban core of Detroit has a higher concentration of households without vehicles, and vehicle access becomes more common towards the outer reaches of the city and the suburbs. This pattern may be partially due to the relative walkability and availability of public transportation in central Detroit compared to the outer tracts of the region, but the distribution of household incomes in figure 4 suggests that affordability plays a bigger role here.

EcoWorks is in what appears to be a pocket of higher vehicle inaccessibility relative to surrounding tracts, with the proportion of households without vehicles in tracts more immediately adjacent to the EcoWorks location being anywhere between 15-45%. This data helps to further make the case for a resilience hub based out of EcoWorks.

Figure 8 - Area Deprivation Index (ADI) 2019 state ranking by census tract

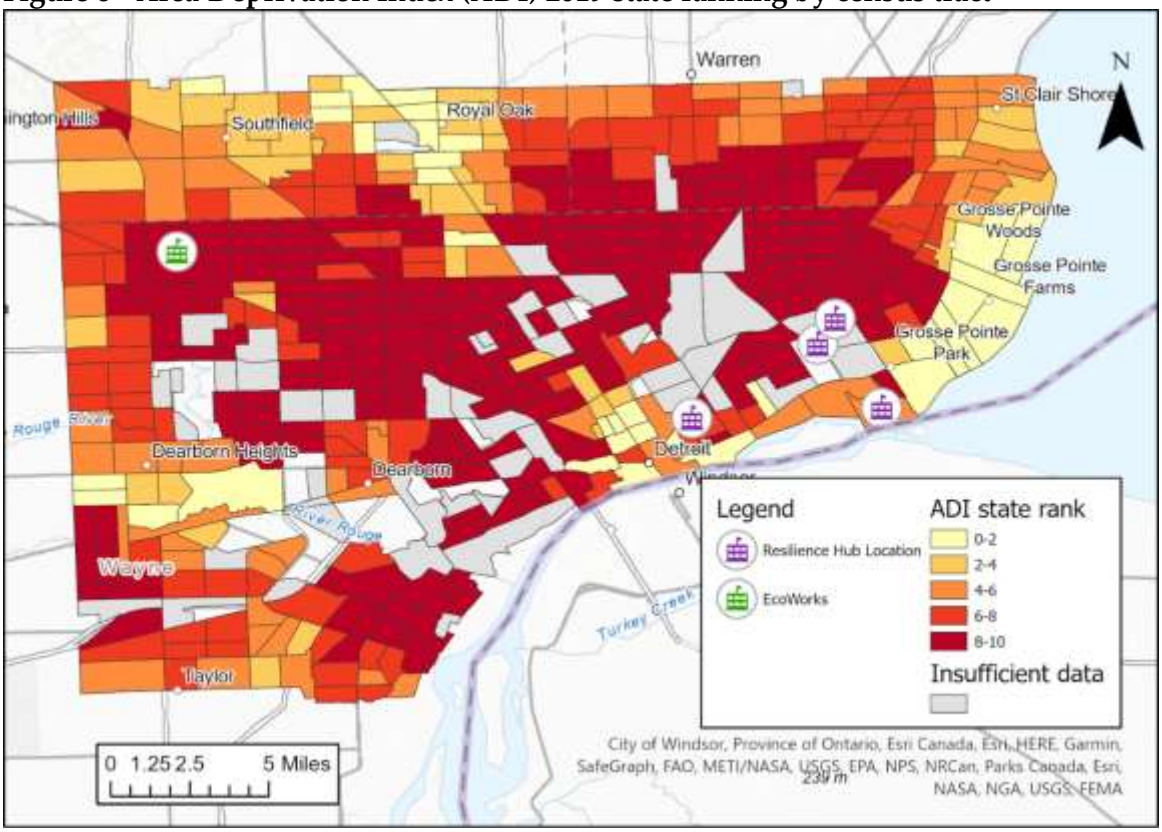


Figure 8 shows the distribution of rankings for Detroit area census tracts according to the Area Deprivation Index (ADI). Data retrieved from: University of Wisconsin Center for Health Disparities Research, Esri[90]

The ADI is a measurement developed by the Health Resources and Services Administration and made publicly accessible by the University of Wisconsin Center for Health Disparities Research. The Index compiles data from the U.S. Census Bureau, weighting a set of variables to produce a 1-10 scale for each geographic unit being measured. In this map, the scale is set based on Michigan data only, so the rankings seen here are relative to the rest of the state. The set of variables is comprehensive, but primarily captures measures of employment, housing quality, and income. The scale is intended as an indicator of how "disadvantaged" an area is; researchers have connected higher scores on the ADI to poorer public health outcomes. These outcomes - higher rates of diabetes and cardiovascular disease, to name a couple - are also tied to heightened sensitivity to climate hazards.[91]

Looking at the distribution of high ADI rankings in Detroit, a clear picture emerges again - one that rhymes with the findings of the other maps before it. Almost the entire City of Detroit falls in the upper rankings of the scale, indicating extreme deprivation. The high rankings almost immediately taper off outside of city bounds. From this map, we can see that an EcoWorks resilience hub would serve a highly deprived part of the city.

By visualizing data spatially and understanding where the most vulnerable populations are, EcoWorks and other Detroit organizations can ensure the ideal placement of hubs to have the most impact. This should not replace community outreach and engagement for hubs, but rather inform EcoWorks and others in identifying the communities to begin holding these conversations. Without speaking with people from Detroit, who live in these neighborhoods, it is hard to do better than an educated guess about what these maps are telling us.

Community Engagement:

Resilience hubs are, by nature, shaped by the communities they serve. We set out to incorporate community engagement components that would allow for direct input, questions, and ideas from members of the community who would either benefit from resilience hubs, or that worked for the kinds of organizations that could form or collaborate with resilience hubs.

Neighborhood(s) & Eco-D Community Monthly Meetings:

EcoWorks currently runs a program called "Eco-D", based in part on the EcoDistrict model of community development and urban regeneration.[92] Eco-D facilitates hyper-local collaborative community groups focused on energy security initiatives like energy-saving workshops, in-home visits, and appliance upgrades and has carried out other projects related to water conservation and community engagement.[93] Eco-D is currently working in four Detroit neighborhoods: HOPE Village, Southwest, West Village, and Yorkshire Woods. Each neighborhood has its own unique community structure, assets, and needs that are addressed by the organizations and community leaders located in that neighborhood. EcoWorks has also considered adding a fifth Eco-D neighborhood in the area surrounding their current office, located adjacent to Rogell Park. This Eco-D neighborhood does not yet have clear boundaries but would be home to a prospective resilience hub based out of the EcoWorks office.

Our client partner EcoWorks has established relationships with the Eco-D neighborhoods they partner with, and they connected us with monthly Eco-D meetings which directly informed our understanding of the needs and desires of prospective resilience hub beneficiaries. Our team attended existing monthly community meetings on Zoom with HOPE Village, Southwest, and Yorkshire Woods. At these meetings we were able to explain our project, gather input on community resilience, take note of grassroots community communication strategies and priorities, and solicit neighborhood-specific ideas and feedback about resilience hubs. After explaining who we were and what our project's purpose was, we solicited relatively open-ended feedback on what attendees thought a resilience hub could offer that would be most helpful to strengthen their own community. The feedback was mostly related to specific ideas of what a hub in their community could offer, which is captured in the Community Engagement Takeaways that follow Table 9

Focus Group:

Our team hosted one dedicated focus group session, intended to reach members of various block groups that are not yet home to resilience hubs. We originally planned to host two virtual focus groups during consecutive weeks, one on a Wednesday evening and the other a Tuesday evening, to allow for different attendees. We offered $25 in compensation in the form of an Amazon gift card for one hour of participation. The focus groups were advertised through several brief presentations at existing virtual block group and community meetings, as well as dedicated email communications from EcoWorks to promote the focus groups. Due to a low number of RSVPs, we consolidated to just one focus group, anticipating approximately 10 attendees based on RSVP responses. However, the focus group was attended by only two community members and one EcoWorks staff member. We proceeded with the presentation and brainstorming sessions as planned, and we received valuable feedback from the participants. We were pleased that one participant was in leadership at a well-established community organization and the other worked for the City of Detroit, as they gave informed and thoughtful answers. However, the focus group did not accomplish one of our intended goals: having input from community members outside of active community organizations, nonprofits, and public sector roles who could speak to a potential resilience hub's impact on their daily lives. To expand direct input from residents, we chose to incorporate feedback from community meetings held by Eco-D neighborhoods that we attended outside of our focus group.

The planned and executed format for the focus group was to give a brief ten-minute presentation detailing our project's purpose, the concept of a resilience hub, connections to more familiar forms of community resilience, and examples of local resilience hubs. We then opened to conversation around a series of broad questions meant to solicit feedback and facilitate brainstorming. The topics included questions about community assets and needs, environmental hazards and anticipated climate impacts, and examples of successful community organizations. The questions are included below:

TABLE 9: FOCUS GROUP DISCUSSION QUESTIONS:

CATEGORY:	Question:	Intent of the Question:
COMMUNITY BASED QUESTIONS	What are some of your favorite parts of your community?	Existing trusted spaces
	What parts of your community do you lean on in a crisis?	Existing trusted organizations
	Are there parks, gardens, or natural spaces in your neighborhood?	Green spaces
	Where do you buy your groceries?	Food security
CHALLENGES AND CLIMATE CHANGE	What environmental hazards most concern your community? Air quality? Water quality?	What hardships do they already face from the environment
	What natural disasters most concern your community? Floods? Heat? Freezes?	What are their top concerns for climate related events
	How will climate change affect you? Your community	Knowledge about climate change and its impacts
COMMUNITY SUPPORT AND RESILIENCE	What are your community's greatest assets?	Community strengths that can support the hub
	What resources does your community need most?	Community weaknesses that can be addressed in a hub
	What do your most effective community organizations have in common?	Insight to community connectedness
	Would you consider your home, water and utility bills affordable?	Ability to feel secure in their living situation

Community Engagement Takeaways:

Youth resources: At several community engagement touchpoints, people suggested hubs acting as safe and productive gathering places for youths including tutoring, volunteer opportunities, sports, and other engaging activities.

Intergenerational support: One novel suggestion that came from our Focus Group was the notion that hubs should be intentional about having programming accessible to the many generations represented in their communities. For example, youth volunteering or tutoring programs could relate to opportunities to help seniors shovel snow or apply salt on their sidewalks or driveways. The community awareness promoted by resilience hubs would also lead to increased awareness of seniors in the community that may need other forms of assistance during or after a disturbance.

Job training: The idea of job preparation and training was suggested frequently This included computer literacy training, especially geared toward common computer applications used for

jobs with the City, such as Microsoft 365. Specific training courses geared at job certifications were also mentioned, such as referee certification.

Flood assistance: The suggestion of flood assistance was frequent and took many forms. Detroiters have and will continue to face flooding issues because of poor stormwater infrastructure and increased precipitation. Suggestions included distribution of pre-flood preparedness kits and sandbags, help with water removal and cleanup, and assistance filing and pursuing claims for government flood assistance.

Entrepreneurial support: Several people suggested that day-to-day services at resilience hubs could include space for entrepreneurs to work or access services to help their businesses.

Meeting with the Detroit Office of Sustainability:

We met with Joel Howrani Heeres, the Director of Sustainability for the City of Detroit. The City is currently working to turn the Lenox Center in the Jefferson Chalmers neighborhood into a resilience hub. They are working with the Chicago-based nonprofit Elevate, who is acting as project manager. They intend for the site to have solar + storage but at the time of our interview they had not yet determined what programming will be offered. The City already works with Eastside Community Network (ECN), who operate their own resilience hub, on the Resilient East Side Initiative and wants to leverage that relationship to build a network of resilience hubs on the East side of Detroit. The City also hopes to turn a new recreation center at Chandler Park and Brilliant Detroit daycare centers into smaller resilience hubs. Their goal is to have City-supported hubs that share training, referrals, support. The City has been able to direct some funds from the American Rescue Plan Act of 2021 (ARPA) to the recreation center at Chandler Park. Joel pointed out that while the City of Detroit may not have capacity to coordinate a resilience hub network, that five of the 11 recreation centers in the city are run by community-based nonprofits and these could become resilience hubs. One of these recreation centers already functions in its neighborhood as a de facto FEMA claims center. The City could provide 1-2 grantees per District with micro grants for things like rain gardens, communications networks, or other resilience projects reflective of the City's Resilience Toolkit. The City also envisions the Climate Vulnerability Analysis it is currently developing as a tool to pick optimal resilience hub locations. The City is able to apply for federal pre-disaster funding, such as the BRIC program if it can justify projects that improve resident quality of life or access to services. The City also has interest in the findings of this report and how it can inform models for training and City involvement with the community organizations or nonprofits operating resilience hubs as well as best practices and creative funding methods.

Interviews with Existing Hubs

The goal of this project is to understand best practices for establishing and operating successful resilience hubs to inform EcoWorks and equip them to start their own hubs and support others in the community. We conducted four interviews with stakeholders directly involved with the establishment or management of resilience hubs in a variety of cities. We selected the City of Baltimore because of its value as the first city to implement resilience hubs and the large number

of hubs working in concert there. We chose Minneapolis, another Midwestern city looking at resilience hubs as an option to address social and climate inequity in their city. We chose the city of Ann Arbor, located very close to Detroit, but with very different demographics and city resources. Also, we met with one of the organizers behind an existing resilience hub already in Detroit. It is our hope that these interviews will provide valuable insight into best practices, pitfalls, and the wide variety of possibilities for resilience hubs.

Ann Arbor

We spoke with Dr. Missy Stultz, the Sustainability and Innovations Manager for the City of Ann Arbor on September 21, 2021. At the time of our interview, Ann Arbor had one functioning resilience hub and was in the process of developing a second, both led by the nonprofit Community Action Network (CAN). CAN's first resilience hub is based out of the Northside Community Center and focuses on resource distribution. Based on conversations with the city about resilience priorities, they determined their biggest vulnerability was power outages and focused on getting solar plus storage that could keep them operational for 3-5 days without power. Besides learning about CAN's progress with their two resilience hubs, the main takeaway from this conversation was that there is no 'standard' definition of a resilience hub.

In Ann Arbor, the resilience hubs are seen less as crisis response centers and instead focus on community. The city, while involved with these hubs, does not currently factor them into emergency response plans. Ann Arbor has a robust nonprofit network and community organization network and while the city owns the sites of the two hubs and could exert more influence, they maintain a more hands-off approach, allowing the nonprofit to dictate the actions and approach of the resilience hub. We discussed site selection for hubs at length, as it is vital to choose a trusted community location people are comfortable visiting, and ideally that they have already physically been to before it became a hub. Another piece of insight was that despite them being 'trusted' infrastructure, schools can make poor resilience hubs because it is not always prudent to allow any community member to enter school grounds and to gather community members in schools for the kinds of day-to-day activities that are essential to building resilience from a hub.

- **Structure:** Hands-off approach, municipally organized but CAN operates day-to-day operations.
- **Key Features:** Solar generation and storage, trusted non-profit in community, hands-off but supportive City involvement.
- **Funding:** MoonShot Grant program, private donor in touch with the City.

Minneapolis

We spoke with Kelly Muellman from the City of Minneapolis, Minnesota on October 27, 2021. She shared that the biggest challenge faced by resilience hubs in Minneapolis is a lack of trust in the city and some nonprofits. People need their basic needs met in order to plan for the future, and in areas where basic needs are not met, hubs should be filling in those gaps. Kelly's idea of a successful resilience hub included funding raised and relationships made by the city that are

handed over to the community, to community organizations or leaders. Ideally, a resilience hub is an effort in self-governance, agency, and autonomy. Additionally, a hub should facilitate a network of goods and services that meet the needs of the community and ensure its community has the resources and relationships necessary to respond to emergencies.

- **Structure:** Municipal organized and one active hub in partnership with Little Earth of United Tribes.[94]
- **Key Features:** Focus on energy efficiency in low-income neighborhoods, solar assessments, asthma mitigation installs and trust building.
- **Funding:** Grants and municipal dedicated funds.

Detroit: Eastside Community Network:

We spoke with Ricky Ackerman, the Director of Climate Equity at Detroit's Eastside Community Network (ECN) on October 27, 2021. ECN has already created a resilience and wellness hub, named the Stoudamire Wellness Hub, based out of their own office building. When space in their own office building opened when a tenant left, they decided to utilize that space to create a resilience and wellness hub, an idea they had been considering for approximately two years. Their hub currently provides wellness support like exercise spaces and health-based programming, and they continue community support that predates the resilience hub through help flood assistance claims and following up with government responses. They aspire to have solar + storage, stormwater management and infrastructure improvements, and to add additional forms of community support. However, the cost of a solar + storage system is an obstacle. Because of this, ECN is considering diesel or natural gas generators to offer a resilient energy source at the Stoudamire Hub, though these would produce air pollution, unlike a solar + storage system.

- **Structure:** Based out of ECN's Headquarters.
- **Key Features:** Flood assistance claim support, health programming including yoga, a fitness center, and a variety of events. Preparing cleaning kits and hiring community teams to help clean flooded basements.
- **Funding:** The Kresge Foundation is one source of funding for their climate work.

Baltimore:

Baltimore, Maryland was the first city to adopt USDN's model for a resilience hub network and deploy city-level personnel and resources to coordinate interconnected resilience hubs. We spoke with Aubrey Germ, the City of Baltimore's Climate and Resilience Planner, who is the current point of contact at the city working with their resilience hubs. When we initially spoke on October 7, 2021, the City of Baltimore had 15 resilience hubs in operation. Only four at that time had solar and storage arrays, but all had signed memorandums of understanding (MOUs) aligning them with the essential goals of a resilience hub. Several more organizations have been able to secure solar panel funding through state-funded grants and in agreement with the city to use those assets for resilience hub duties. In the case of Baltimore, this includes being a gathering space in an emergency including post-disaster staging and resource distribution. The functions and possibilities of resilience hubs shift, and as such the MOUs can evolve over time with the input of the hubs and the city. By working with the city, the resilience hubs of Baltimore are connected

to resources related to climate impacts, public health, and funding and resource sources they may otherwise not reach. In their monthly meetings, coordinated by the city, the hubs are able to share resources and updates with one another. We speak to the resilience hub Network in more detail in the following Case Study.

- **Structure:** Municipally managed hub network that connects trusted grassroots community organizations operating independently.
- **Key Features:** MOU's create a standard and expectations even across unique hub offerings.
- **Funding:** Municipal funding and fund reallocation for emergency response, grant programs and partnerships including USDA Forest Service.

BALTIMORE CASE STUDY

Introduction to Baltimore's Resilience Hub Program

The City of Baltimore's resilience hub network is among the most well-established in the country. Starting in 2016, the first few hubs were conceived as grassroots, community-organized and operated neighborhood centers to provide community resources in areas of Baltimore where historical disinvestment and discrimination have left residents the most vulnerable to environmental hazards.[95] Since then, the hubs have begun to grow into a robust network of facilities and organizations that support Baltimore communities in the day-to-day as well as in emergency situations.[96]

Baltimore Resilience Hub Locations (2021)

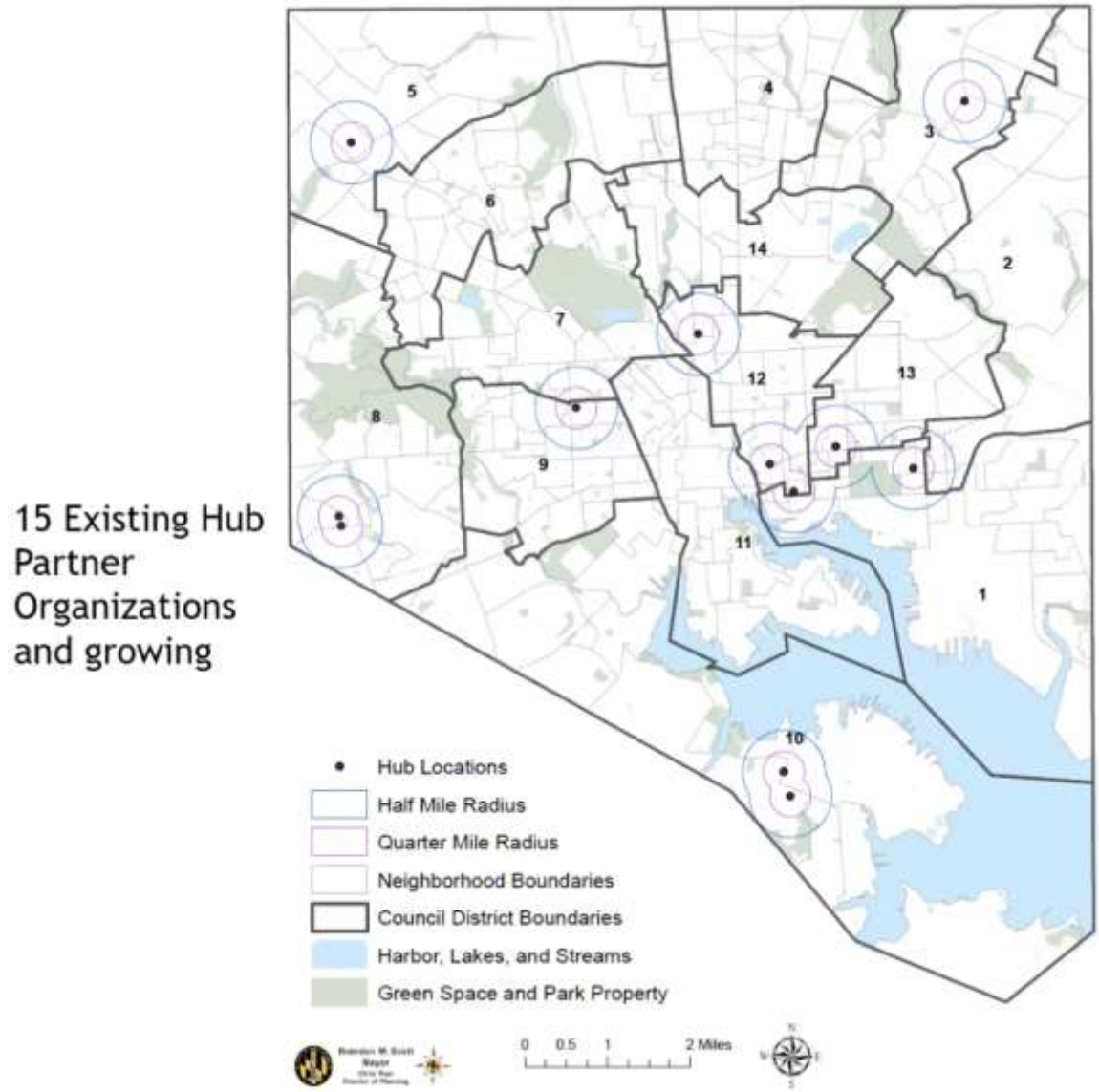


Figure 9 - A map of current Baltimore resilience hub locations. Retrieved from the Baltimore Office of Sustainability.[97]

As EcoWorks and other organizations consider implementing resilience hubs in Detroit, Baltimore serves as a fitting case study. The two cities share similar socioeconomic contexts. Much like in Detroit, white flight and disinvestment have left residents of Baltimore with poorly maintained infrastructure and degrading public services. Baltimore's history of environmental racism is also evident in the city's current landscape, with food deserts and floodplains primarily impacting predominantly Black neighborhoods.[98] Of U.S. metropolitan areas with populations larger than two million people, Baltimore and Detroit have the widest spreads in median household incomes between their urban cores and their overall metropolitan areas.[99] In this section, we will take a closer look at Baltimore's resilience hub program to draw insights for successful implementation in Detroit.

How Baltimore's Resilience Hub Program is Structured

Resilience hubs were conceived in Baltimore as a way for communities to build local capacity to respond to climate hazards by leveraging existing community infrastructure. Baltimore's hubs are based in buildings that residents are in frequent contact with such as churches and recreation centers. In most cases, these buildings already serve as bases of operations for trusted community organizations that already perform many of the services that a resilience hub would, such as distributing meals during crises or providing a place to cool off during heat waves.[100]

Baltimore's resilience hub program is supported by two key relationship dynamics:

1. The relationships between the resilience hub organizations and their surrounding neighborhood; and
1. The partnership between Baltimore's resilience hub organizations and the City's Office of Sustainability (BoS).[101]

The second dynamic plays a significant role in Baltimore. By coordinating with the City, hub leaders can gain access to additional resources, information, and funding that allows them to function at higher levels of capacity. The resilience hub liaison at BoS also serves as a point of contact that hubs can use to elevate concerns to the city with relative ease.[102] Figure 14 illustrates the ways in which the city and community organizations can correspond with each other to build community resilience in Baltimore neighborhoods.

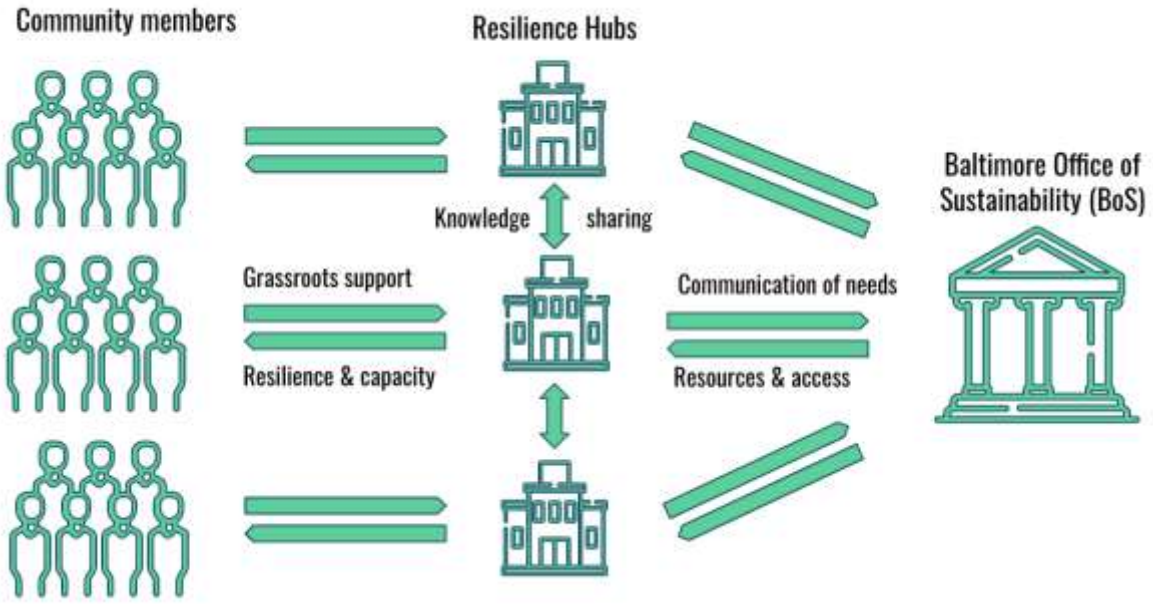


Figure 10 – A visualization of the Baltimore Resilience Hub Program network structure. Arrows indicate flows of information and/or resources.

As Baltimore's resilience hub program has grown, the city has taken steps to formalize the status of hubs by having them sign memoranda of understanding (MOU). The original MOU used by the city set baseline expectations for hubs to be 'activated' in emergency situations, providing necessities like shelter, backup power, food, and water during extreme weather or other when other hazardous conditions are present. Baltimore's Office of Emergency Management (EOM) is also granted permission to call on hubs to activate, although failure to do so incurs no penalties on the hubs.[103]

By 'enrolling' hubs in the city program with a non-binding MOU, Baltimore maintains a low barrier to entry for community organizations that are interested in adopting a resilience hub model. This is important for two connected reasons, first, it makes joining the program relatively frictionless from an administrative and financial point of view - community organizations are often operating on tight budgets and limited staff capacity. The less time and money organizers need to spend to initiate involvement in a new city program, the better. Secondly, the no-strings-attached nature of the MOU means that organizations can join risk-free; it allows neighborhoods to participate to the extent that they are comfortable, without putting up any collateral. Keeping enrollment in the resilience hub program frictionless and risk-free has been key in building community trust in the program over time.[104]

Trust has been a central component of Baltimore's success with resilience hubs. The city has a long history of segregation and housing policies that were designed to impoverish Black communities.[105] Discriminatory broken-windows policing practices in the city have been the source of outrage. The murder of Freddie Gray at the hands of Baltimore police officers in 2015 was a breaking point following years of police brutality and led to mass civil unrest that received

months of national attention.[106] The relationship between Baltimore residents of color and the city government is reasonably fraught.

"We did a lot of outreach… we were met with some resistance. Sometimes the [best thing to do] is just to pick up the phone and call, instead of being behind an email." - Aubrey Germ, Baltimore Office of Sustainability

The resilience hub model is deliberately designed to overcome this mistrust, placing control in the hands of community leaders. Still, considering the structural racism inherent to Baltimore's civic institutions, the growing scale of the City's resilience hub program is a notable feat. As of early 2022, the program supported roughly 15 individual hubs - an achievement that is in no small part a result of the trust-building efforts led by BoS. In interviews, the City of Baltimore's Climate and Resilience Planner, Aubrey Germ, emphasized this trust-building approach as essential to the program's high participation: "We did a lot of outreach… we were met with some resistance. Sometimes the [best thing to do] is just to pick up the phone and call, instead of being behind an email." Germ also stressed the importance of incorporating feedback from current participating organizations into the outreach strategy employed by BoS.[107]

This approach paid dividends when the COVID-19 pandemic struck. Germ began hosting virtual monthly meetings with representatives from each hub in mid-2020 to facilitate check-ins wit

h the hubs while following public health guidelines. These check-ins evolved into networking calls, where the organizers operating hubs are now able to share information and resources with each other and build relationships between communities.[108] Meeting with the entire network of hubs also allows Germ to collect feedback and keep a finger on the pulse of major resilience issues facing specific communities or the city as a whole.[109]

Impacts of Resilience Hubs in Baltimore

Due to the infancy of the resilience hub program in Baltimore and the diversity of services that each hub provides to its neighborhood, it is difficult to quantify the impacts of resilience hubs in Baltimore communities. However, there are already examples of interventions that were made possible by the program which create a compelling case for the benefits of establishing resilience hubs.

Stillmeadow Community Fellowship: Resilience in Daily Life, and in Times of Crisis

Stillmeadow Community Fellowship is a church located in Southwest Baltimore. Following major flooding in the area during the spring and summer of 2018, Stillmeadow leaders noticed a gap in the assistance being provided to more affluent communities nearby, and the aid that was available to Southwest Baltimore. Filling that gap, the church began running community food distribution programs and partnering with the Red Cross to coordinate flood response. BoS saw a resilience hub developing on its own, and invited the congregation to join the program so that it could receive additional support from the city. To date, Stillmeadow is one of the most active

resilience hubs in Baltimore, and a great demonstration of the wide range of benefits that the resilience hub model has to offer.

Stillmeadow PeacePark - Building Everyday Resilience

The Stillmeadow Community Fellowship church lies on the same property as a 10-acre forest, which for a long time sat neglected. Not long after joining the resilience hub program, and in partnership with BoS (among several other organizations - including the USDA Forest Service), the church launched its Stillmeadow PeacePark project.[110]

In taking on this project, Stillmeadow is restoring the forest, turning it into a 'PeacePark' that worshipers and neighbors alike can enjoy. With volunteer help from students and environmentalists, the congregation has led a cleanup of the woods, as well as the installation of walking trails and a tree nursery.[111]

Stillmeadow PeacePark is a 10-acre project to restore an urban forest in West Baltimore. A church has teamed up with various partners to plant 3,000 trees and build walking paths, meditation stations and an apiary to produce honey. Cisterns and rainwater barrels have been installed next to the church to water newly planted fruit trees along Frederick Road and help reduce neighborhood flooding during storms. (Baltimore Sun | SOURCES: Steedman Jenkins, Greivin Ulate, USDA Forest Service, OpenStreetMap)

Figure 11: A map of Stillmeadow Community Fellowship and the Stillmeadow PeacePark in Southwest Baltimore. Retrieved from *The Baltimore Sun.*[112]

Stillmeadow aims to use the PeacePark to combat environmental and climate hazards that have been exacerbated by historical racism and disinvestment in Southwest Baltimore, all while providing the community with opportunities to learn and connect with nature.[113] In an initiative to boost sustainability, the church has set up cisterns and rain barrels to catch stormwater for the tree nursery and a vegetable garden. Solar panels and battery storage have been installed at the church, providing clean energy and making the facility resilient to power outages.[114]

But the PeacePark project's efforts go beyond generating clean energy and conserving water. In revitalizing the forest, Stillmeadow is confronting some of the many environmental injustices created by segregation. The loss of tree canopy in majority Black and minority neighborhoods worsens air quality and heightens the urban heat island effect.[115] The PeacePark is a place for students and community members to learn about the history of environmental racism in their own neighborhood and provide them with tools to address its consequences. In partnership with student researchers from the University of Delaware, Stillmeadow is capitalizing on this opportunity to explore the intersection of climate resilience and environmental justice.[116]

Sandbag distribution - Planning Ahead for Climate Emergencies

After the flooding that took place in 2018, Stillmeadow sought out ways to confront similar crises proactively. On top of building resilient capacity with long-term measures like installing solar and improving stormwater catchment on the property, the church has taken steps to be prepared for immediate actions in an emergency.

In August of 2020, Tropical Storm Isaias was bearing down on Maryland, and Stillmeadow saw an opportunity to act. Reaching out through a councilmember for their district, the church was able to partner with the Department of Transportation (DOT) to set up an emergency sandbag distribution operation in their parking lot.[117] Residents were able to drop by and pick up sandbags to place around their own properties in order to mitigate flooding. The following year, Stillmeadow coordinated with BoS, DOT and the Office of Emergency Management (EOM) to be even more proactive, distributing sandbags from the church in advance of the spring/summer rainy season.[118]

Other resilience hubs have taken similar measures while operating in "crisis mode." In interviews, Germ recounted examples of hubs acting as post-flood staging areas for emergency crews; in another example, she described a hub that provided food and respite to firefighters responding to a major fire emergency nearby.[119]

Covid-19 Pandemic: Co-Benefits of Resilience Hubs

Resilience hubs have equipped Baltimore's communities with adaptive capacity that is useful outside of the challenges that the hubs were conceived to address. Since the onset of the Covid-19 pandemic, the hubs have served as important points of contact for both the city and residents, ensuring that pandemic mitigation efforts and resources are reaching community members in vulnerable parts of the city.

Through the hub's connection to BoS, they were able to procure more emergency food assistance to address the increased food insecurity in the early months of the pandemic. The hubs are also distribution points for Personal Protective Equipment, COVID testing centers, and even vaccination sites.[120] As trusted messengers, hub organizers have been more effective in garnering community trust than the City has, especially on issues like vaccine skepticism. These initiatives are all made possible by the convenient location of the hubs and their substantial volunteer bases.[121]

The role of resilience hubs in Baltimore's COVID response is a good example of how the non-specificity of hubs can be an asset. Building local capacity that is flexible is an important part of establishing community resilience. In their early conceptualization, hubs were meant to address climate hazards; in reality, the tools used to confront those problems are the same tools needed to confront a whole host of problems that frontline communities face even in the absence of extreme weather. By expanding their definition of resilience to include pandemic preparedness, Baltimore's resilience hubs have demonstrated the type of flexible capacity that allows hubs to best serve their communities.

Challenges for the Baltimore program

The success of the Baltimore resilience hub program has not been without adversity. Here we will outline a few of the major constraints that the program faces, as well as some of the ways these challenges are being dealt with.

Funding

Baltimore's resilience hubs face funding challenges similar to those that any community organization or local nonprofit does. The majority of funding for capital projects and resource provision comes from state grant opportunities. These funding opportunities can be very limited in availability and scale, and often become available at short and uneven intervals. This leaves most hubs in a situation where they are constantly applying for additional grant funding and relying heavily on volunteer support or community fundraising.[122] Outside of a sliver of staff time dedicated by BoS (and occasionally OEM), The City of Baltimore itself does not allocate any funding to the resilience hub program. BoS regularly assists with grant writing and provides letters of support for grant applications submitted by hub organizations.[123]

For several hubs, Maryland state grants have funded the addition of solar panels and battery storage, along with energy efficiency upgrades to the buildings themselves. Other grants through FEMA have made high-quality emergency supplies available to the hubs.[124]

Solution strategy: after action reports

Baltimore's resilience hubs need funding solutions that are sustainable in the long-term. While the funding landscape is ever-evolving, hub organizations will have to strategize to be competitive for currently available grants.

Many state and federal grant applications require documentation of quantifiable impacts to be viable for funding. One possible path to funding is for hubs to file 'after action' reports with BoS post-emergency, describing their role in mitigating damages from whatever emergency occurred.[125] These reports could serve as a basis for quantifying the impacts of the program down the line.

Implementation feasibility

The program has grown significantly since its inception, but due to the hyper-local nature of the hubs themselves, what constitutes a 'resilience hub' can vary between neighborhoods. Many hubs are limited in what they can provide by the buildings they are based out of. For example, of the 15 active hubs in Baltimore, only 4 of them currently have solar panels and battery storage.[126] This is partially due to funding obstacles, but many hubs are in buildings with roofs that are unable to support solar panels.[127]

Solution strategy: tiered enrollment

With limited resources and funding, Baltimore hubs have had to make the most of what they can get.

As the program has continued to grow, BoS has begun to revise the resilience hub MOU to account for the variation in capacity and resource availability across hubs. The new agreement accounts for three tiers of resilience hub, outlined here:

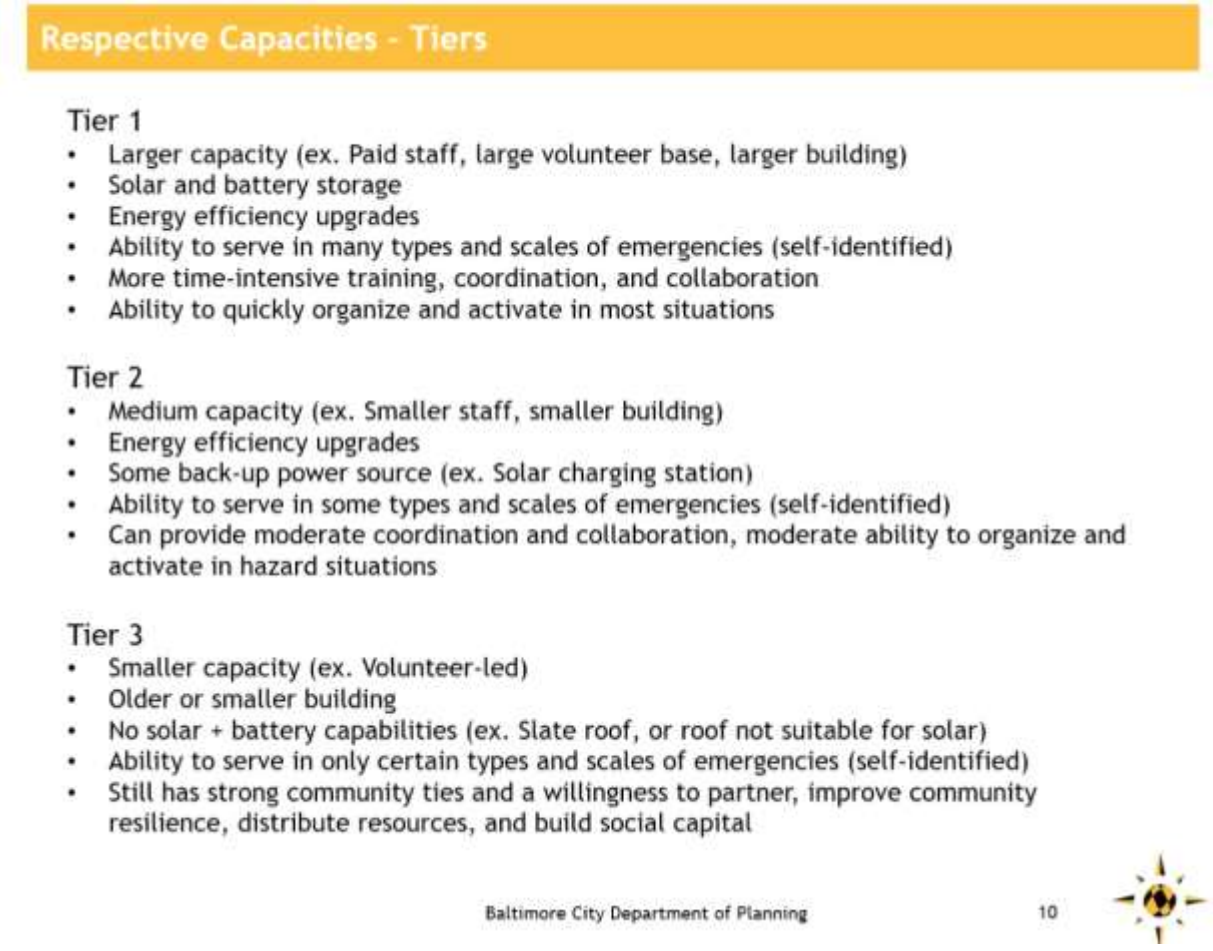


Figure 12 - A Baltimore Office of Sustainability slide outlining the proposed tier structure for resilience hubs.[128]

Staff capacity

While resilience hubs are locally organized and largely self-sufficient, the support they receive from the City of Baltimore is limited, and somewhat uncertain in the long-term. Currently, Ms. Germ serves as the coordinator of information exchange and resource distribution between the city and the hubs, as well as the convener of network-wide meetings. By her estimate, Germ is able to dedicate roughly 15% of her staff time to the program as a whole; there is no dedicated role at the city level for ensuring the success and longevity of the resilience hub program.[129] A more substantial contribution from the City would go a long way towards helping the program embrace its broader potential - that could take the form of more program-facilitating staff, or simply allocation of funds.

Lessons for Detroit and EcoWorks

The lessons learned from researching Baltimore's resilience hub program and interviews with the Baltimore Office of Sustainability can be distilled into several key takeaways that should be of use to EcoWorks and other potential Detroit hub operators. Those takeaways are as follows:

General takeaways

1. *Establish and maintain a knowledge-sharing network between resilience hubs*

   Baltimore's resilience hub program has been able to sustain itself and grow in large part due to the network of hubs that it has built. By having regular correspondence between hubs, the program has been able to start building institutional knowledge for hubs to share as a collective. This knowledge sharing allows for all hubs to integrate best practices and find resources more efficiently.

   The network structure is also a tool for trust building. Community members can see that new hubs are not being created in a vacuum - they are adopting a tried-and-true model that has worked in nearby neighborhoods. This provides a sense of familiarity for residents who might otherwise be skeptical of the prospects or legitimacy of a new start-up community center.

2. *Seek correspondence with the City*

   Correspondence with the municipal government can be productive for resilience hubs, as long as there are officials who are responsive and willing to build a relationship. In Baltimore, the Office of Sustainability has been able to act as an advocate for hubs at the city level, elevating concerns to the relevant officials and providing access to government resources that hub organizations would otherwise need to obtain independently.[130]

3. *Promote low startup costs for new resilience hubs*

   Baltimore has managed to grow its hub network quickly in part due to the low barrier to entry for new hubs. It does this by allowing would-be hub operators to enroll without strings attached - with the MOU's signed by new members being non-binding.

Introducing a tiered system for hubs, as Baltimore is considering, is another way of ensuring high participation in the program. By communicating that commitment and capacity vary across levels, the tiered system avoids deterring potential hub organizations that might not have the capability to fulfill every promise of the prototypical 'resilience hub'.

4. *Opportunities to build community resilience are broad*
With the same tools that resilience hubs use to promote climate resilience, contributions can be made to public health efforts and economic development initiatives. Baltimore's hub network has played an important role in COVID-19 mitigation efforts, and Stillmeadow's PeacePark has proven useful towards educational and general community well-being outcomes.

EcoWorks-Specific takeaways

1. *Stillmeadow PeacePark is a potential proof of concept for Rogell Park revitalization*

   The Stillmeadow Community Fellowship's initiative to transform 10 acres of forest into a community park demonstrates what is possible for EcoWorks to achieve with Rogell Park. The PeacePark has succeeded through volunteer support from the Stillmeadow congregation and a number of sponsorships.

   One major funder of the PeacePark revitalization is the U.S.D.A. Forest Service, which has committed $270,000 over three years to the effort as part of a research grant for studying the rehabilitation of urban forests.[131][132] When exploring funding opportunities for the Rogell Park project, EcoWorks should look towards Stillmeadow as a successful example funding a similar project.

2. *EcoWorks could fit the role of a 'Tier 2' hub, as outlined in Baltimore framework*

   The proposed tier structure from Baltimore in Figure 14 is instructive. While EcoWorks does not have the capacity to operate a 'Tier 1' hub - they do not have a facility the size of Eastside Community Network's Stoudamire Wellness Hub, or a large paid staff that can manage many intensive trainings and emergency response - the organization can fit comfortably into the definition of a 'Tier 2' hub that generates backup power, assists in some capacity during moderate-scale hazard events, and provides general community support.

Just as a single resilience hub is the product of community efforts, 'resilience hubs' as a concept come from substantial collaboration and knowledge sharing between organizations across neighborhood, city, and state lines. By learning from places like Baltimore and employing the lessons learned from earlier iterations of resilience hubs, EcoWorks can fast-track its resilience efforts on the path to success, and in turn become an example for other communities.

"If it can work in Baltimore, it can work in Detroit." - Morgan Grove, U.S. Forest Service Researcher (The Baltimore Sun)[133]

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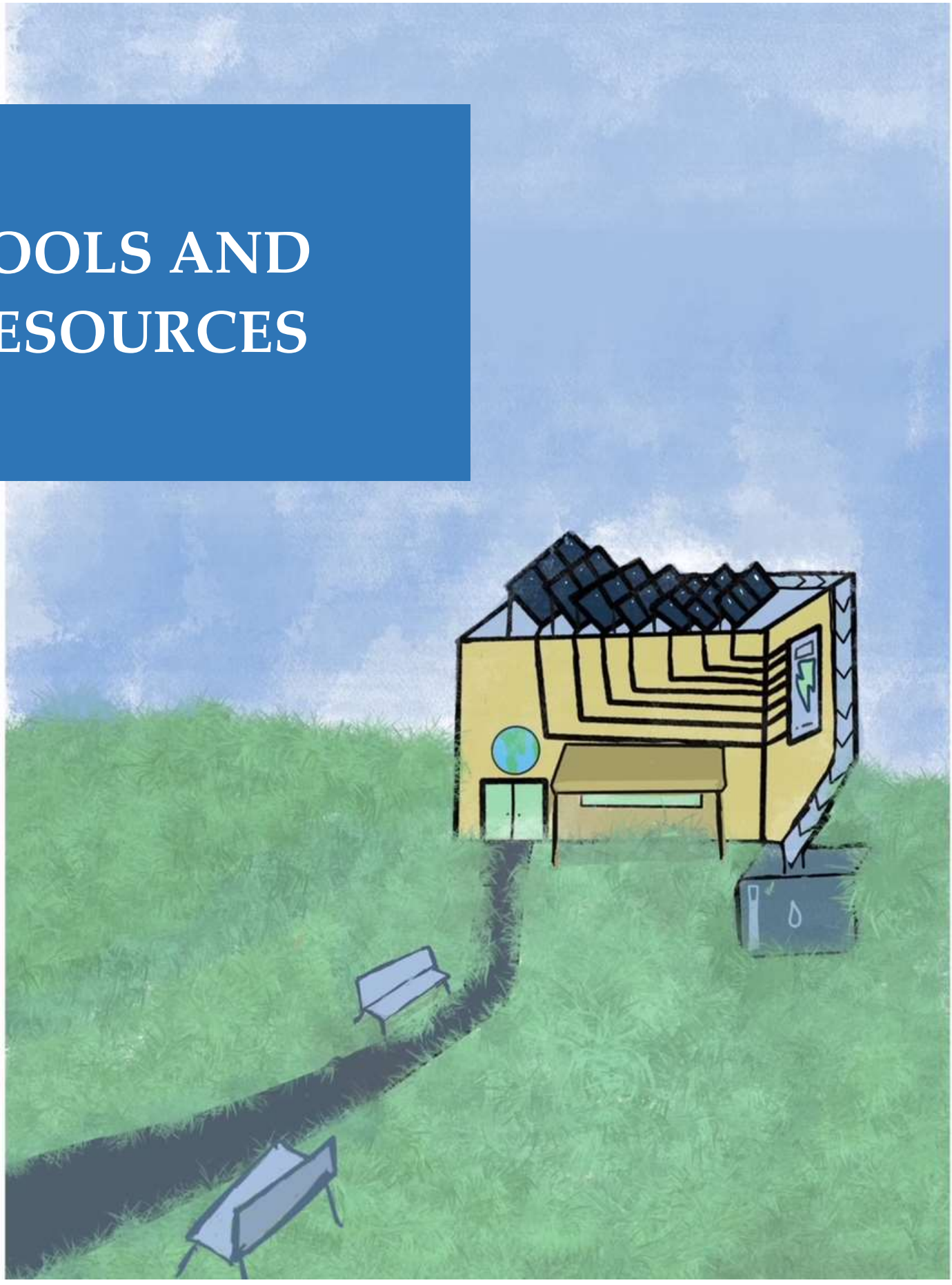
TOOLS AND RESOURCES



ONGOING COMMUNITY EDUCATION MATERIALS

For the complete materials, please see **Appendix C**

EcoWorks requested that in addition to providing best practices and methodology for establishing resilience hubs, that we also produce community-facing tools that can be used to help connect the residents to the purpose of resilience hubs and how they could benefit from them. These can be utilized to build enthusiasm and active participation during the community input and trust building stage of establishing a resilience hub as well as to provide as many community members as possible the opportunity to give input on how a hub can best suit their needs.

The first of these community-facing educational materials is a mailer (see Appendix C for more detail) that EcoWorks can send out to invite residents to meetings, focus groups and planning events, and a similar flier (see Appendix C) was created to hand out at community events. Each of these tools will have a QR code for people to quickly access a survey and provide feedback on the Hub and what type of support and services they would like to see most. Both the mailer and flier give a general overview of EcoWorks' goals and the concept of resilience hubs. We highlight issues residents face and connect them to climate change to provide a foundation to imagine what a resilience hub could be and do for them. These options are derived from our literature review, our interviews with existing hubs, and previous community engagement.

We also assembled a Tool-Kit (see Appendix C) that summarizes the most relevant parts of this report in a community-facing way, including best practices for resilience hubs and our recommendations. EcoWorks headquarters recently underwent a total energy transformation that included solar panels, heat recapturing, stormwater management, and are investigating things like solar windowpanes, insulated skylights to reduce their footprint and create a closed-loop and resilient system for their office even further. This toolkit can be shared with community members and stakeholders who visit the EcoWorks office as well as community members

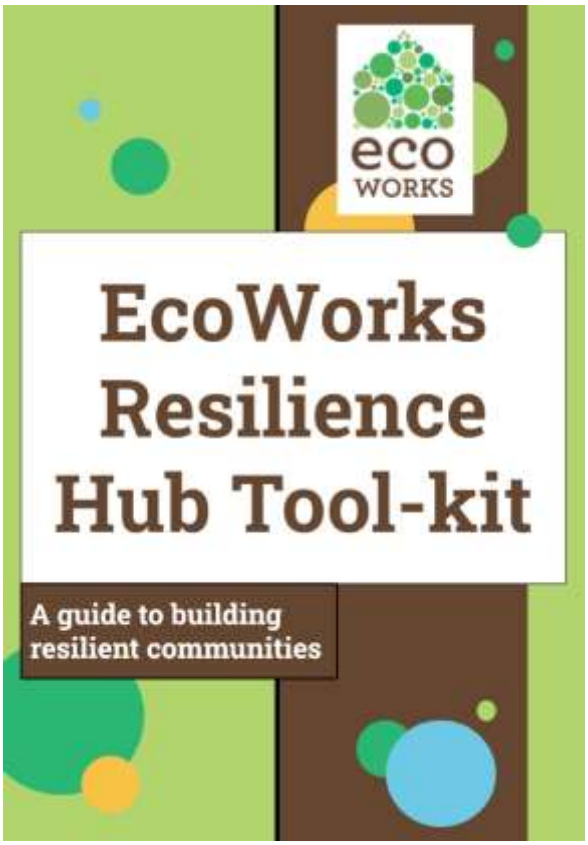


Figure 13. The cover of our Toolkit.

FUNDING OPPORTUNITIES -TRADITIONAL OPPORTUNITIES

As with many grassroots community development projects, finding stable and consistent funding sources for resilience hubs poses a challenge. Financial stability is key to continuity of services, capacity to expand resources, and asserting resilience hubs as a reliable asset to the communities they serve. Just as resilience hubs modify services based on community needs, their funding strategies must adjust to access sources most relevant to their functions. For example, a hub might pursue a different grant to pay for installation of a solar + storage system than they would pursue to purchase tools and emergency response equipment. Other needs may include upgrades to the physical infrastructure, floodproofing, transportation access, technology upgrades, training, and funding for other hub-specific resources.

Municipal Funding

Every city operates with a unique funding structure from which to pull operational budgets for municipal projects, including resilience hubs. Resilience hubs are still a relatively novel concept in many cities and municipalities, presenting both challenges and opportunities for creativity in the pursuit of funding. In our interviews with the Cities of Baltimore and Ann Arbor, we learned that the City's government was involved in early stages of resilience hub development and able to help direct funds from non-municipal sources towards resilience hubs (i.e., private donors or state grant funds). The city-level involvement in these cases helps to facilitate collaboration between emergency management services, climate action plans, public health initiatives, and the organizations operating hubs. The City of Detroit has an annual community grants budget of $35,000 within the Detroit Climate Strategy. Each of the seven council districts could hypothetically qualify for grants to act as seed funding for resilience hubs functions.

Some municipalities dedicate parts of their budget to fund green infrastructure and sustainable initiatives while others establish dedicated funding mechanisms in the form of bonds. (Bird, 2003; U.S. Environmental Protection Agency, 2008). While it would be a challenge, municipalities could advocate for intergovernmental fund transfers to use towards resilience hubs such as emergency aid support from FEMA or supporting hub infrastructure upgrades. There is a precedent of similar actions with state registration and fuel sales being shared with local municipalities for infrastructure repairs. There are programs that use a similar structure for emergency services, which could be leveraged to support resilience hubs for emergency response preparedness and implementation.[134]

It is worth considering that many long-time Detroit residents have a high level of distrust in government due to systemic racism in city policies, corruption, and lack of effective direct action for their most vulnerable communities and residents. Longtime residents may struggle to trust a government run and funded program without long-term massive, coordinated trust building activities. Additionally, if funds are requested through millage, tax, or bonds directed towards citizens it could reduce buy-in to the project or place undue burden on low-income households.

Partnerships/ Fundraising

Adequate and reliable funding is key to communities gaining access to the resources they need to benefit the most vulnerable community members. CBOs in all sectors deal with the consistent need to track down new funding or compete for grants year after year. Later in this report we explore possible funding sources for community resilience as both funding and resource access can be challenging. CBOs often rely on partnerships for both funding and resources, findings show that 95% collaborated with local governments and 93% with local non-profits rather than the 40% who collaborated with national non-profit organizations who may not understand the unique needs their communities face.[135]

Figure 5. The percent of survey respondents and type of organizations they collaborate with in their sustainable community endeavors.

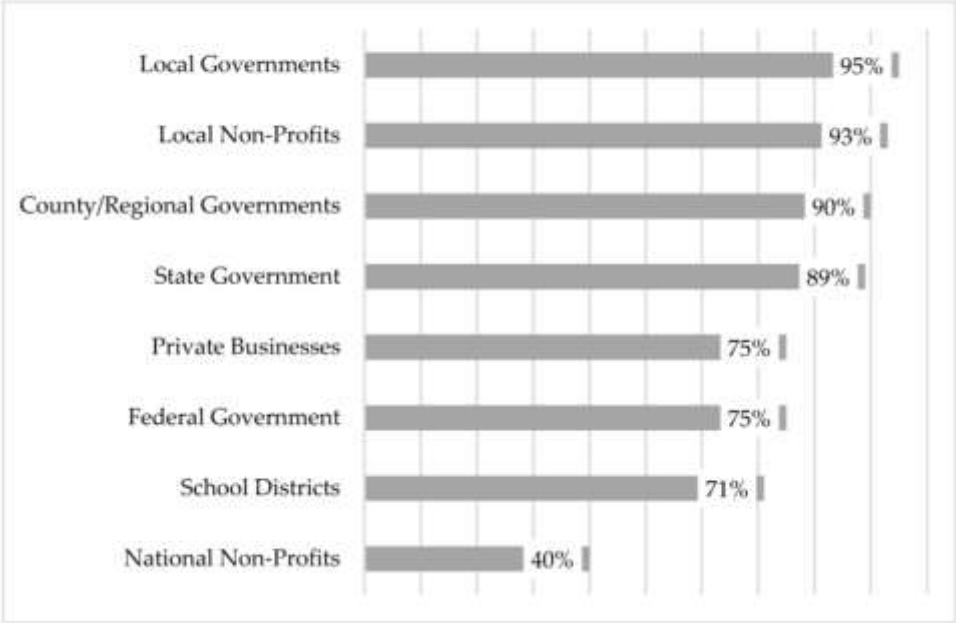


Figure 14 - The percent of survey respondents and type of organizations they collaborate with in their sustainable community endeavors.[136]

Hubs, in most cases we encountered, are operated by nonprofit organizations, faith-based organizations, and other entities with pre-existing fundraising strategies. Resilience hubs are an emerging trend in equity-based community development programs that reflect a growing acknowledgement of the need for local approaches to address climate adaptation. Fundraising campaigns can use this Framework Report and examples of successful hubs to solicit donations or investment from donors and other partners. One unique funding mechanism for renewable energy programs is the non-profit SolarRise, a crowdsourcing fundraising platform that hosts renewable energy projects that individual donors and organizations can call for donations to support projects.[137]

Local businesses could be potential partners for such investments into their workforce. Potential resilience hub host organizations could approach companies like Meijer, a grocery superstore chain based in Michigan and with an interest in local giving.[138] There are several corporations operating in Detroit that offer community outreach funds and support, though many of those same corporations have a legacy of pollution and harm to the same communities. When resilience hubs look to corporate or private donors, they should consider whether it impacts their legitimacy or trustworthiness in the communities they serve. Each year the non-profit Points of Light recognizes 50 companies for superior corporate citizenship, using time and resources to improve quality of life in communities where they operate. The 2021 honorees included several companies with locations in Detroit, namely KPMG, DTE, Blue Cross Blue Shield, and UPS.[139]

Federal Grant Programs

There are multiple streams of federal funding that can apply to the various components of resilience hubs such as climate change and adaptation response, emergency management, public health, community development, and other initiatives. Some of the obstacles in pursuing federal grant money are arduous application processes, strict eligibility requirements, and limited grant writing or administrative capacity in the organizations that need funds. The following grant programs represent some of the potential sources of funds for resilience hub efforts that EcoWorks or other organizations operating resilience hubs could pursue. For a more concise list, refer to Appendix D.

Federal Emergency Management Agency (FEMA) programs:

Hazard Mitigation Grants Program (HMGP):

Following a presidential disaster declaration, 5% of HMGP funds are allocated to a smaller pool of projects that only require a cost-effectiveness narrative, rather than a benefit-cost analysis, improving the chances for projects with social benefits that are more challenging to quantify.

Pre-Disaster Mitigation (PDM) Program:

The Pre-Disaster Mitigation (PDM) Program is intended to help plan and direct hazard mitigation projects before a disaster strikes, funding plans that reduce risk to people and infrastructure and ideally minimize the total amount post-disaster funding needed.[140] Eligible activities for PDM funds include infrastructure retrofits, soil stabilization, hazard mitigation planning, dry flood proofing of non-residential structures, and small local flood reduction projects. In general, the federal government will contribute 75% of funds for proposed projects with the non-federal entity reliable for 25% of cost sharing, but in "small and impoverished communities" projects may receive a 90% federal share and be liable for only a 10% cost share.[141]

In October 2021, the House of Representatives passed The Resilient Assistance for Mitigation for Environmentally Resilient Infrastructure and Construction by Americans Act (Resilient AMERICA Act). This Bill, if passed in the Senate, will increase funding streams to FEMA's Pre-Disaster Mitigation grant (PDM) and extend eligibility for these grants to include private non-profits, making it more directly applicable to the organizations operating resilience hubs.[142]

Previously, only state, territorial, and tribal governments and a small number of nonprofits were eligible to apply. Amendments from the Disaster Relief and Recovery Act of 2019 began the process to replace the PDM program with the Building Resilient Infrastructure and Communities (BRIC) program, described below.

Building Resilience in Communities (BRIC):

FEMA's 'Building Resilience in Communities' program is intended to "shift the federal focus from reactive disaster spending toward research-supported, proactive investment in community resilience."[143] While the program currently focuses on "larger infrastructure projects that enhance human health and ecological benefits for a multitude of residents," the program could potentially expand to include more diverse and medium scale projects, in which case applications for resilience hub networks could be included. Another difficulty is that BRIC applications require a benefit-cost analysis, and it can be challenging to quantify how social benefits and other 'soft' benefits outweigh costs. For the Fiscal Year 2020 (FY 2020) cycle, the application period for BRIC ran from late September to late January, with successful applicants announced in early July and awards disbursed in December.[144] The program received $500 million in funding for FY 2020, receiving 991 applications, of which they selected 406 for further review. These included 65 applications for "mitigation projects", 272 for "capability and capacity building activities," 69 projects for "management costs," and 8 projects were awarded "direct technical assistance. FEMA sets aside a portion of funds for selected projects in "small and impoverished communities," with their FY 2020 selections totaling $39.2 million in project costs for 46 projects.[145]

Department of Housing and Urban Development (HUD) programs:

Community Development Block Grant (CDBG):

Each year, Michigan receives approximately $30 million in funds from HUD's CDBG program, which is administered by the Michigan Economic Development Corporation (MEDC), on behalf of the Michigan Strategic Fund (MSF). Funded projects include community development, economic development, and housing projects, generally in cities, towns, or communities with fewer than 50,000 residents.[146] Local governments can receive grants for a variety of activities to improve infrastructure and environmental health and several activities in resilience hubs could qualify for CDBG funding.

Community Development Block Grant - National Disaster Resilience (CDBG-NDR):

In 2014, the Federal Department of Housing and Urban Development announced the CDBG-NDR competition.[147] The competition awarded close to $1 billion in funds for long-term community resilience projects and disaster recovery for governments of cities, states, and localities affected by major declared disasters in 2011-2013. After several phases and rounds of review, 40 states and communities were invited to the final phase of the competition and ultimately, 13 communities were awarded the CDBG-NDR funds with awards ranging from $15 million to $176 million.[148] This kind of program would be less directly applicable to a resilience hub network, unless it was an already functioning network poised to help the City following a major disaster.

USDA Forest Service:

The Stillmeadow PeacePark in Baltimore is using Forest Service research grants to support the revitalization of their 10 acres of degraded forest in southwest Baltimore.[149] The Forest Service's Research and Development, State and Private Forestry and National Forest System branches are all working in conjunction with the Stillmeadow Community Fellowship Church to carry out this urban forest revitalization project. If EcoWorks were to move forward with a resilience hub utilizing the Rogell Park area, similar funding could potentially be pursued for urban silviculture and restoration.

U.S. Department of Energy (DOE):

The State of Michigan, and potentially the City of Detroit could apply on behalf of resilience hubs for grants such as the Weatherization Assistance Program (WAP) or the State Energy Program (SEP) to assist with solar + storage investment or household weatherization initiatives related to resilience hubs.

U.S. Department of Commerce, Economic Development Administration (EDA):

The Economic Development Administration has six programs termed "Investing in America's Communities" that intends to equitably invest $3 billion from the American Rescue Plan to rebuild local economies to make them more resilient to future economic shocks.[150] Eligible recipients for the following four EDA programs include public and private nonprofits and 'associations acting in cooperation with a subdivision of a state,' which could include resilience hubs.

EDA's Economic Development Disaster Supplemental Funding

This is a grant program intended to help communities and regions recover from natural disasters and rebuild stronger and more resilient.

EDA's Investment for Public Works and Economic Development Facilities

The recipients for this grant, also referred to as the Public Works Grant, also include public and private nonprofits and 'associations acting in cooperation with a subdivision of a state.' This program is meant to help "distressed communities revitalize, expand, and upgrade their physical infrastructure." Because of the Public Works Program's goals to increase the capacity of a community to promote job creation and skill-training, invest in business incubator facilities, and improve technology-based facilities, the grant could play a role in funding resilience hubs geared towards workforce development or other projects aligned with EDA investment priorities.

EDA's Economic Adjustment Assistance Program (EAA):

This program supplies grant funding and technical assistance to communities that are currently or have in the past experienced adverse economic changes due to a variety of causes, which could be applied to many Detroit communities. The program includes strategy grants to develop

comprehensive economic development strategies (CEDS) as well as implementation grants to help carry out activities outlined in a CEDS. EAA is considered EDA's most flexible program, allowing funds to be applied to planning or construction, market or environmental studies, or rehabilitating or equipping facilities, among other activities.

EDA's Economic Development Planning Assistance Program

This grant is meant to assist in short- or long-term planning efforts for CEDS.[151]

Iv. State and Local Grant Programs

The Office of Climate and Energy within the State of Michigan's Department of Environment, Great Lakes, and Energy (EGLE) has continually evolving grant offerings, in some cases related to small-scale solar and energy improvements.[152] In addition to grants, the Office of Climate and Energy's Energy Services department provides sponsorships, rebates, and loans for diverse energy projects by a variety of entities in the state.

State Sponsorship Program

At the time of this report's publication, the Office of Climate and Energy's Energy Services department is offering 1:1 match funding for educational and training activities that foster informed energy and sustainability decisions.[153] The program is open to public sector organizations, 501c3 or 501c6 organizations, and small businesses with fewer than 500 employees and the maximum award is $2,500 per applicant. The application period opened in September 2021 and will remain open until September 2022 or until the $100,000 of allotted funds for the program are depleted. A grant like this, while small, could help fund a variety of energy or sustainability related programs in resilience hubs.

Community Energy Management Incentive Program

Energy Services offered rebate awards up to $25,000 per applicant to local governments, tribal governments, and other public service entities in Michigan for energy implementation projects.[154] The application opened November 2021 and has closed because the $250,000 of allotted funds have been committed.[155] Another round of funding for a similar program would be valuable for solar + storage and other energy infrastructure improvements for resilience hubs.

NextCycle Michigan Recycling Grants

This program has small community education grants with the target of providing access to recycling education resources for small communities (fewer than 10,000 households). Small communities can access educational and outreach resources to better their recycling programs, reduce contamination, and educate residents.[156]

Other Matching Funds Grants

A recent example, though not able to be used for resilience hubs in its current form, would be the Michigan Solar Communities Program. This program was a matching funds program for

Michigan entities interested in summarizing the three models for the Clean Energy for Low-Income Communities Accelerator (CELICA) and to update their guidebook for community solar programs in Michigan communities.[157] Awardees will receive funds from a total pool of $135,000, and applicants must provide a 50 percent match of the total requested grant funds. The solicitation period for this program opened January 31, 2022, and proposals were due February 12, 2022, for a grant period February 2022 to February 2023.[158] Organizations interested in developing resilience hubs or improving their existing energy infrastructure should stay abreast of new and changing grant offerings from the state.

FUNDING OPPORTUNITIES - EMERGING OPPORTUNITIES

Renewable Energy

"The Midwest has a highly energy-intensive economy with per capita emissions of greenhouse gasses more than 20% higher than the national average." - Winkler et al.[159]

Michigan's climate emissions can be reduced while resilience hubs reduce costs and, in some cases, even raise funds through renewable energy generation and storage. USDN estimates that initial capital investment for solar generation can range from $150,000 to $250,000 for hubs.[160] Therefore, it is essential to leverage multiple funding sources for this program. For example, Northside Community Center in Ann Arbor was able to partially fund their solar installation through the Solar Moonshot program, left coast fund, and the Ann Arbor together grant programs.[161] Another grant option is through the Federal Investment Tax Credit for Commercial Solar Photovoltaics which covers a sliding scale (26% as of December 2020) tax credit to help offset the cost burdens of going solar.[162] This can include building upgrades such as roof structural stabilization all the way to energy storage systems.[163]

Additional programs exist which allow for little to no upfront capital investment. Using a Power Purchase Agreement (PPA), a private company owns/operates the project and is paid back through energy savings.[164] This works best in established locations and large-scale projects have found substantial returns. Two school districts in Arkansas partnered with Entegrity as their PPA provider. They began by supporting energy upgrades and followed up with solar installation. With 1,400 panels implemented, they reduced energy consumption by 1.6 million kilowatts and in 3 years had a 1.8-million-dollar surplus.[165] Additionally, Michigan State University secured North America's largest solar carport array through a PPA with Smart Energy Decisions.[166]

Beyond for-profit firms, there are groups such as MISaves Green Bank program, a non-profit funding option that EcoWorks leveraged to achieve their Net Zero capacity building.[167] There is also RE-volv who helps non-profits go solar through connecting donor advised funds, impact investors and foundations with recoverable grants.[168] Some of their funding comes from the U.S. Department of Energy's National Renewable Energy Laboratory and the Solar Energy Innovation Network as part of their ongoing effort to assist BIPOC-led houses of worship to implement solar.[169] Another option to support renewable energy transitions for nonprofits is the Solar United Neighbors, who offers steps and resources to evaluate the best options from direct ownership of renewable energy systems, third-party ownership, or a co-op model.[170] Although not present in Michigan yet, they could be a pivotal partner to include in the resilience hub. A platform for a broader fundraising is SolaRise, a fundraising platform that specializes in helping nonprofits estimate the cost and crowdsource funding for solar installation.[171]

An additional partner is Grid Alternatives, who believes that "free, clean electricity from the sun should be available to everyone". Their model focuses on making solar power "practical and accessible for low-income communities that need the savings and jobs the most yet have the least access". In 2008 they partnered with California for a solar incentive program dedicated towards low-income solar rebate programs that has now been utilized in multiple states as well as Nicaragua and tribal communities.[172]

Another renewable generation opportunity for the urban environment is wind energy, which has often been underutilized. This is due largely to the space constraints often faced in the urban environment. This requires smaller, more building adjacent wind generation which has not been as thoroughly researched or implemented as their taller commercialized counterparts.[173] Wind power is traditionally viewed as a top alternative to traditional generation sources. In addition to space considerations, low to moderate wind speeds of 2 to 5 meters per second must be considered in the design and application. Aesthetics are also essential for community buy in. Authors Campbell and Stankovic distinguish between three categories of urban wind: stand-alone turbines, retrofitting turbines onto existing buildings and full integration of turbines with architectural form.[174] Community Implementation and feasibility assessment require thorough research into local urban wind speed and top wind locations. A research paper from the University of Michigan compiled the DOE and NREL wind power generation potential and siting recommendations for Detroit, nearly all Southwest Detroit is considered to have poor wind resources.[175]

This is not an exhaustive list of renewable energy opportunities; new partnerships are being created every day. A complete list of funding and networking resources can be found in Appendix C. A robust program should aim for not only generation of renewable energy, but reliable storage as well. Renewable energy is considered an intermittent energy source.[176] Their dissociated generation and use are called the duck curve effect, a graphical representation of the overgeneration of renewable energy during the day and the increased demand during peak night hours.[177]

Community Solar

One program to help reduce costs and address intermediate generation comes from DOE's National Renewable Energy Laboratory's (NREL) Connected Communities program which builds a "collection of buildings and distributed energy resources (DERs) that incorporate integrated energy management strategies at the multi-building scale". This program outlines five key characteristics of Connected Communities. The first is to include grid-interactive and efficient buildings that can shed, shift, and modulate energy nimbly. Another is to incorporate multiple energy technologies like energy storage, renewable energy generation, or load flexibility. The third characteristic is to not only manage energy across multiple buildings, but to optimize energy use and financial benefits by not approaching DERs on a building-by-building basis. The last characteristic is to physically share systems for things like thermal plants, energy storage, or community solar to reduce overall costs and balance local loads.

The Connected Communities program offers scalable solutions and helps to reduce Capex, installation costs, and maintenance costs while creating resilience by enabling the system to endure longer power outages. This program can be impeded by local or state laws around solar, storage, or transmission, the operations and regulations related to the utility companies, infrastructural costs and installation, and other causes.[178]

Income Generation Opportunities - Community Solar Grid

The community of Highland Park, whose residents often faced dark streets and high utility bills, began a co-op energy generation program called Soulardarity. This program focuses on creating a democratic, equitable and resilient energy system to better support their residents who faced "devastating blackouts, massive floods, incredibly high energy bills, and the loss of basic services including the repossession of streetlights throughout the city".[179] Leveraging education and organizing they have built a successful co-op that installs solar systems and provides training for solar careers. Their membership rates go as low as $10, and they offer an annualized discount of 6% on members' power purchases. Other cities around the country also have youth training programs including Baltimore and Power52 foundation.[180]

Income Generation Opportunities - Membership Program

Using Soulardarity's model of fee-based participation, Eco-Works could enact a small or even sliding scale membership contribution. This model would help raise funds for Eco-works with a small participation fee for community members and organizations to gain access to support services such as grant writing, energy audits, legal aid, and others. Although often many of these services are offered pro-bono through places like university law clinics and non-profit incubators, EcoWorks is a trusted member of the community and with a long-standing interest in the residents and organization success. A membership contribution model could help offset the internal costs to operate a resilience hub, allowing more staff focus on essential services and programs.

A local success story of a membership program in Detroit is the North Rosedale Park Civic Association (NRPCA) who maintains the Community House and Park.[181] They offer services such as foreclosure prevention, a newsletter, weekly farmers market, advocacy efforts, community events and at the Community House they offer direct services like free Wi-Fi, health and wellness activities. Their fee is $75.00 per year or $20 per quarter.[182]

Space Rental/ Retail Space

In some instances, a large building such as ECN's office building are adapted into resilience hubs, allowing for some surplus space to be rented out as a source of funding for the resilience hub. At the Eco-D meeting for Yorkshire Woods, it was suggested that the currently vacant location of the Old Dorothy Fisher school could be renovated and used as a resilience hub, and being a large

school building, it would have enough space to allow for community programming as well as some potential rental space.

Though not fully operational yet, the Commongrounds in Traverse City is a real estate cooperative aiming to develop affordable real estate for working class locals in an expensive housing market and meet additional community needs.[183] Their pilot project is a mixed-use building scheduled to be completed in Fall 2022 with space for family, wellness, arts, and restaurants to foster an inclusive, connected community. The cooperative model intends to provide value to its tenants and partners while improving the quality of life of those in the community. While not a resilience hub, this is a project with very similar goals that has found a way to provide stable funding through mixed-use to allow affordable housing offerings and meet community needs.

Carbon Offset Program

An emerging potential revenue stream for the Hub could be to develop a carbon offset and carbon credit program which could then be sold on the carbon market. The National Renewable Energy Laboratory's Climate Neutral Research recommends a local offset program that includes activities such as tree planting, community gardens, renewable energy projects, building efficiency, vehicle efficiency and improved public transportation. Not only can these be verified for reductions and help overall carbon levels, but they also offer community benefits and align with EcoWorks and Eco-D energy efficiency programs.[184] [185]

This is a novel idea and from our research has not been implemented in Resilience Hubs. Discussions with EcoWorks and their soil sequestration project show a smaller scale version of what could be a novel solution for a partnership with a business looking to purchase offsets or a carbon market. The key here would be to prove additionality, or that the offsets you produce would not happen without the financial support of the offset purchase program.[186]

One hypothetical method of providing offsets would be to quantify the carbon reductions resulting from implementation of solar arrays on homes versus remaining connected to the current grid, then selling the difference between the two generation sources in carbon offsets. Another potential carbon offset program could be through soil remediation of Rogell Park. The efficacy and accounting of soil carbon “remains exceedingly complex” and would require stringent protocols to ensure accuracy of sequestration practices.[187] For any offset activity looking to become an offset program, there is a general life cycle for carbon offset credit programs outlined by the OffsetGuide.org.[188] The outline in Figure XX below shows the carbon offset project development process, if EcoWorks were interested in leveraging their office’s energy efficiency upgrades and Strategic Community Initiative (SCI) to enter the carbon market.

Table 10: Offset Action Plan		
Step	**Action**	**Description**
1	Methodology development	The protocol used to verify and certify the offset reductions.
2	Project development, validation, and registration	An offset project is designed by project developers, financed by investors, validated by an independent verifier, and registered with a carbon offset program.
3	Project implementation, verification, and offset credit issuance	An offset project is implemented, then monitored and periodically verified to determine the quantity of emission reductions it has generated. Verification reports vary in but one year is standard before the offset is verified and ready for transfer.
4	Offset credit transfer	Offset providers sell offsets to buyers and "transfer" the credits. Offset credits may change hands multiple times (getting transferred among multiple accounts) before they are ultimately retired and used.
5	Offset credit retirement	Offset buyers take the credit out of circulation so it cannot be transferred or used again.

Reduced Energy Examples

A unique business model that works to implement the retrofitting of buildings with 100% electric heating and cooling, BlocPower boasts in helping to reduce tenants' energy bills by 20-40% for no money down. In May of 2021, they began selling their carbon reductions as carbon offsets to further fund the retrofitting process.[189] With EcoWorks being a leader in the community for renewable technologies in buildings, this could be a partnership or model to emulate.

In India, Infosys developed a community carbon offsetting program to support their company's carbon neutral goals. The company utilized United Nations Sustainable Development Goals (UN SDG) to set up an inhouse rural community carbon reduction and resilience plan. They focused on bringing long term socio-economic benefits to the communities through renewable energy generation, clean cooking technologies. Infosys has eight community-based projects that they have developed and funded. In 2019, they won the United Nations Global Climate Action Award in the "Climate Neutral Now' category for their program and achieving neutrality 30 years prior to their 2050 goals.[190] As more and more companies look to implement carbon offsets to achieve their carbon neutrality goals, EcoWorks could become a partner for these companies, securing them carbon positive emission reductions as they provide funding for projects and community resilience.

Tree Planting Examples

One example of a successful community carbon offsetting program is with the Yale Community Carbon Fund (YCCF)[191] who partners with the Urban Resources Initiative to plant trees for carbon offsets of essential activities such as travel and events. Through this partnership they

ensure their offsets are verified by a non-profit, third-party organization such as The Gold Standard, Climate Action Reserve, American Carbon Registry and Verra.[192] This program allows them to reduce on-campus emissions with "a scientifically supported climate solution."

In 2018, an Australian community of Moyne Shire conducted an analysis of its fleet and found high levels of carbon emissions that require the planting of 3781 trees that successfully live for at least 30 years in order to reach 100% reduced emissions.[193] Although this program is different from buying and selling on the carbon offset market, the city council reimburses private and public planting efforts by the community to achieve their intended results. This model could be employed to engage the local community in green landscape or green infrastructure job training, while generating additional offset levels that can be sold on the market place. What is key about this program is the simple and easy to understand level of reductions for the activity of tree plantings, and the communication to the community. People are able to quickly understand the connection between the GHG emissions and the correlation to plantings. This helps them understand the difference between species, and efficacy of their efforts.

Criticism of Carbon Offsets:

Carbon offsetting is often criticized for incentivizing "gross exaggeration" of offsets claims in its accounting measures. Other critiques include claims of "saving" certain forest land from threats not relevant to them, inaccurate carbon sequestration calculations, and the fact that without decreased demand, tree harvesting, or other harm is simply inflicted elsewhere.[194]

Carbon Markets

An alternative to creating a partnership for direct carbon offset projects is joining the voluntary carbon offset market or a cap-and-trade market. First introduced in 1990 in the US for sulfur dioxide emissions from power plants, "cap-and-trade" programs have been hit or miss, but a tool that is set to re-emerge. Carbon markets work on either credits or allowances that one company or government sells to another who is emitting more. Overtime, these allowances decrease to incentivize continued decarbonization practices. There are multiple active regional-scale markets in the United States and abroad including the Regional Greenhouse Gas Initiative (RGGI) in Northeastern US, in California the Western Climate initiative (WCI) is in partnership with Quebec's market and China enacted their own in-country program for their power companies, and all have seen emission reductions.

The Paris Agreement, and the subsequent negotiations, are moving forward with Article 6 which fixes some of the loopholes that made prior "cap-and-trade" programs unsuccessful.[195] As companies face more and more pressure to reduce emissions, they will be seeking high quality credits that are quantifiable, produce positive environmental and social impacts, and are backed by institutions and accreditations. Another mechanism in place with article 6, is the cap of offsets allowed. Only 50% of reductions are allowed through the carbon market, the rest must be through reductions.[196] This differs from the Science Based Targets Initiative (SBTi) which limits carbon credits and offsets to only 5-10% of total baseline emissions.[197] At this level, companies are

encouraged to abate emissions and EcoWorks headquarters could serve as an example of successful building emissions reductions.

Cryptocurrency

CryptoCurrency has been around since the mid 2000's and is based on a decentralized alternative to the traditional monetary systems. They use a blockchain network that tracks each transaction to avoid double spending of the currency which acts as the regulator.[198] This process is extremely energy intensive and the largest cryptocurrency, Bitcoin, employs this method for its mining of new coins which consumes 139.56 terawatt-hours of electricity per year.[199] An alternative process called proof-of-stake (PoS) is gaining popularity and Ethereum, the second largest cryptocurrency, estimates it will cut the network's energy consumption by ~99.95% once fully transitioned.[200]

Blockchain methods create transparency within transactions, which is what many critics of carbon offsets are calling for in current accounting methods. Regenerative finance (ReFi) is a method that buys carbon offset credits and incorporates those into crypto tokens that are listed on crypto markets/exchanges, as a way for "crypto investors to help preserve the planet". Since each transaction is verified, each sale of a carbon crypto token is able to be retired, essentially "burning" it by locking it away in a blockchain address that no one has access to."[201] This is the real goal of carbon offsets and credits in any market, to retire and lock away/ sequester the reductions. The main flaw remains the same as the traditional carbon market and offset programs, the overall validity of the accounting methods. The crypto carbon market is still in its infancy and highly volatile and unproven, as such we do not recommend EcoWorks join the cryptocurrency market at this time and if they wish to sell carbon credits should join traditional carbon markets.

Drawdown

Having been called "The World's Leading Resource for Climate Solutions", Drawdown is a non-profit that offers the leading research to support a carbon sequestered world as quickly, safely, and equitably as possible. This nonprofit ranks each proposed solution based on carbon dioxide reduced or sequestered, net first cost, lifetime net savings, and lifetime net profit. EcoWorks' own investment in its net-zero building and improvements in energy efficiency in the community through Eco-D and other programs, could contribute to the overall goals of Drawdown.[202]

In June 2021, Drawdown labs launched DrawDown Communities, a partnership initiative to support informational programming to inspire and empower communities across the United States". Drawdown helps communities identify, adopt and scale climate solutions with a focus on environmental justice. The program aims to highlight solutions that will contribute to restoring communities harmed by causes of climate change and benefit from the solutions.[203] They could be a potential future collaborator with EcoWorks or other energy-focused resilience hubs.

Final Recommendations for Detroit Resilience Hub Efforts

We see the value of creating a centralized network of resilience hubs in the Baltimore Case Study. Some hubs within the network offer the same services and others are completely different; the flexibility of service offerings is one of the strengths of resilience hubs.

A successful resilience hub should be connected to the community through direct feedback and engagement. The community's support is integral to the success of a hub and ensures it is developed to best serve the community needs. Siting potential resilience hubs should consider where community members already have ties, whether that be city buildings, nonprofit offices, or faith-based organizations. It is key that the people who will be best served are willing and able to come to the space. Consideration should be taken whether there are locations and organizations that the community already trusts to determine how best to approach a campaign to increase knowledge of resilience hubs and build trust through transparency and sincere pursuit of community input before design occurs. Though assembling this framework report, we have determined the following as the key criteria to consider when choosing locations and organizations to develop a resilience hub:

1. **Accessibility:** Can community members access the space? Can residents without cars reach the space? Is there parking nearby? Is it in a space that would limit who could attend (i.e., a school or accessibility for people with disabilities)? Will there need to be limited hours or days of operation? Is it centrally located? Do community members know the resilience hub exists? Do they know what offerings are available and how it can be a part of their day-to-day or serve them during or after a crisis?

2. **Trust:** Do people feel safe there? Are there negative associations with the space or the organization in the community that should be considered?

3. **Space**: What does the physical space allow for? Is it more conducive to offering classes or office space? Does it have large spaces for events or staging people? Can it support renewable energy projects? Can it support the community in the face of emergency situations (i.e., refrigeration, kitchen, cooling, space to sleep)?

4. **Infrastructural Resilience**: Does the space have a reliable clean energy source? Does it have capacity to operate during power outages? Could it structurally support rooftop solar or other modifications in the future if funding were acquired?

5. **Connectivity**: Is this space affiliated with an organization that is connected to other hubs and community organizations? Does it have a connection to the city? Does it receive communications about emergency management or resource distribution during a crisis? Does it have support and enthusiasm for connecting to a network?

6. **Capacity Building:** Does the organization already offer resources to community members on a day-to-day basis? Is there staff capacity to do so? Are there volunteer programs and a pool of people to call upon for assistance when it is needed in the community (i.e., shoveling snow or sandbagging homes)?

7. **Adaptability:** Is the staff in this space able to adjust to changing circumstances, from day-to-day operations to emergency support? What would it take to train or hire staff or volunteers to make this possible?

8. **Environmental Improvements:** Does the site need remediation? Can the resilience hub help improve air, soil, or water quality on site or in the community? What level of tree canopy is present? Are there concerns about flooding in this space?

Through this project, as we developed best practices, we also determined some pitfalls that should be avoided when establishing or operating a resilience hub. Many of these are generally related to best practices that nonprofits like EcoWorks would encounter in any of its community-facing work.

Table 11: Resilience Hub Pitfalls
Assuming a community's needs or patronizing them.
Rushing through community engagement or trust building because of time constraints.
Disengaging from the community during the process or losing transparency.
Aligning with entities that the community distrusts.
Making decisions on behalf of the community without consent or consultation.

As a network facilitator and eventual resilience hub host itself, EcoWorks should focus on bringing other organizations together and providing information and access to resources. They should make this an 'easy yes' with a low barrier to entry using memorandums of understanding that make it clear that a hub has responsibilities to the community, but that it doesn't have to be 'perfect' to strengthen the community it serves. Some of the common challenges in establishing or operating resilience hubs include:

Table 12: Challenges in Establishing Resilience Hubs
Overall lack of funding for key aspects of hubs.
Difficult application processes for grant funds.
Need to continually re-apply to maintain short-term funding sources.
Difficulty of quantifying social benefits of resilience hubs, which can be a challenge for maintaining transparency with the community and for justifying funding requests or applications.
Limited time availability from the resilience hub host entity's staff to contribute to hub operations.
Difficulty maintaining trust or open communication with the communities being served.
Difficulty reaching all people who could benefit from the services or resources offered at the resilience hub.
Overall lack of funding for key aspects of hubs.

Recommendations of Next Steps for Eco Works:

1. Eco Works should begin community trust building and engagement around the idea of Resilience Hubs.
    - Building trust is a time-consuming process, as it should be. Trusting, engaged communities are integral to the Hub design and ensuring that programming and resources are in line with the needs and wants of the community. This will also increase awareness of the hub that will set it up for success regarding people utilizing its services.
2. Collaborate with Yorkshire Woods.
    - EcoWorks has expressed interest in starting a resilience hub based out of their own office in the next few years. We also recommend that EcoWorks works with the Yorkshire Woods Eco-D community to establish a hub in the abandoned Dorothy Fisher School building. This space is not being used, and there is already interest from community leaders in utilizing this space for a hub. It would also be a possible contender to rent out space to additional tenants to create a reliable funding stream for the hub.
3. Eco Works should leverage the Eco-D network to lay the groundwork to form an eventual resilience hub network among community non-profits and block groups.
    - If Eco-D includes education and outreach regarding resilience hubs into their programming, they could increase the chances of a connected network forming in Detroit in the coming years. Many of the community leaders and nonprofits of Eco-D groups, like in Yorkshire Woods, could show interest in housing resilience hubs with enough information and support from EcoWorks.
4. Support adaptable resilience hubs.
    - Resilience hubs ought to be adaptable to the needs of a community, and while a resilience hub is meant to support a community during and after natural disasters and crises, the ways in which they do that and the additional services they offer can vary greatly. Hubs can offer a wide range of services and should be willing to adapt to distribute resources or information as they become available - especially through a well-functioning network.
5. Eco Works should pursue creative funding streams for the hub.
    - Private donors, federal grants, and state grants will always be a potential source of funding for nonprofits and resilience hubs. Looking outside these traditional streams could increase more flexible funding streams that allow EcoWorks or other resilience hub operators to fund aspects of the project not covered by grants or donor funds.

APPENDICES

Appendix A - Detroit Sustainability Action Agenda Summary[204]

4 OUTCOMES	10 GOALS	43 ACTIONS
1. **Healthy, thriving people**	• Increase access to healthy food, green spaces, and recreation opportunities • Improve air quality and reduce exposure to pollution • Advance equity in access to economic opportunities	1. Provide nutrition and environmental education at recreation centers and parks 2. Create local food purchasing guidelines for City-funded programs 3. Improve access to high quality, healthy food at grocery stores 4. Renovate existing and create new parks throughout the city 5. Expand sports recreation opportunities for youth 6. Expand local air quality monitoring system 7. Create citywide truck routing network 8. Increase tree plantings in vulnerable areas 9. Reduce emissions from City vehicles 10. Expand green jobs training and workforce development programs 11. Prepare Detroit residents for City employment opportunities 12. Launch a digital inclusion program 13. Expand wireless internet access on City buses 14. Launch a diversity, equity, and inclusion initiative
2. **Affordable, quality homes**	• Reduce the total costs of housing, including utilities • Improve the health and safety of existing and new housing	15. Improve access to utility efficiency programs 16. Expand home plumbing repair programs 17. Implement and expand upon the Blue-Ribbon Panel's water affordability recommendations 18. Establish affordable housing preservation goals for building owners receiving City incentives 19. Increase access to information on existing affordable housing

		20. Expand lead poisoning prevention initiatives across the city 21. Create a residential lead abatement training pilot program 22. Develop green building guidelines for new developments receiving City incentives
3. **Clean, connected neighborhoods**	• Transform vacant lots and structures into safe, productive, sustainable spaces • Reduce waste sent to landfills • Make it easier and safer to get around Detroit without a personal vehicle	23. Improve processes to purchase City owned vacant lots 24. Support neighborhood-based efforts to care for vacant lots and structures 25. Develop a fee structure and associated rules for irrigation only water accounts 26. Launch a citywide recycling campaign 27. Expand curbside recycling to multi-family buildings 28. Expand recycling to public spaces and all City facilities 29. Develop a best practices framework for commercial scale compost operations 30. Launch residential composting pilot program 31. Improve mobility connections between neighborhoods and job centers 32. Implement safety measures to reduce crash severity 33. Expand Detroit's protected bike lane network
4. **Equitable, green city**	• Enhance infrastructure and operations to improve resilience to climate impacts • Reduce municipal and citywide greenhouse gas emissions	34. Create neighborhood scale, distributed green infrastructure projects 35. Incorporate green stormwater infrastructure into street redesign and greenway projects 36. Integrate climate change impacts into hazard mitigation planning 37. Improve resident access to sustainability-related City services 38. Expand emergency preparedness and communication tools

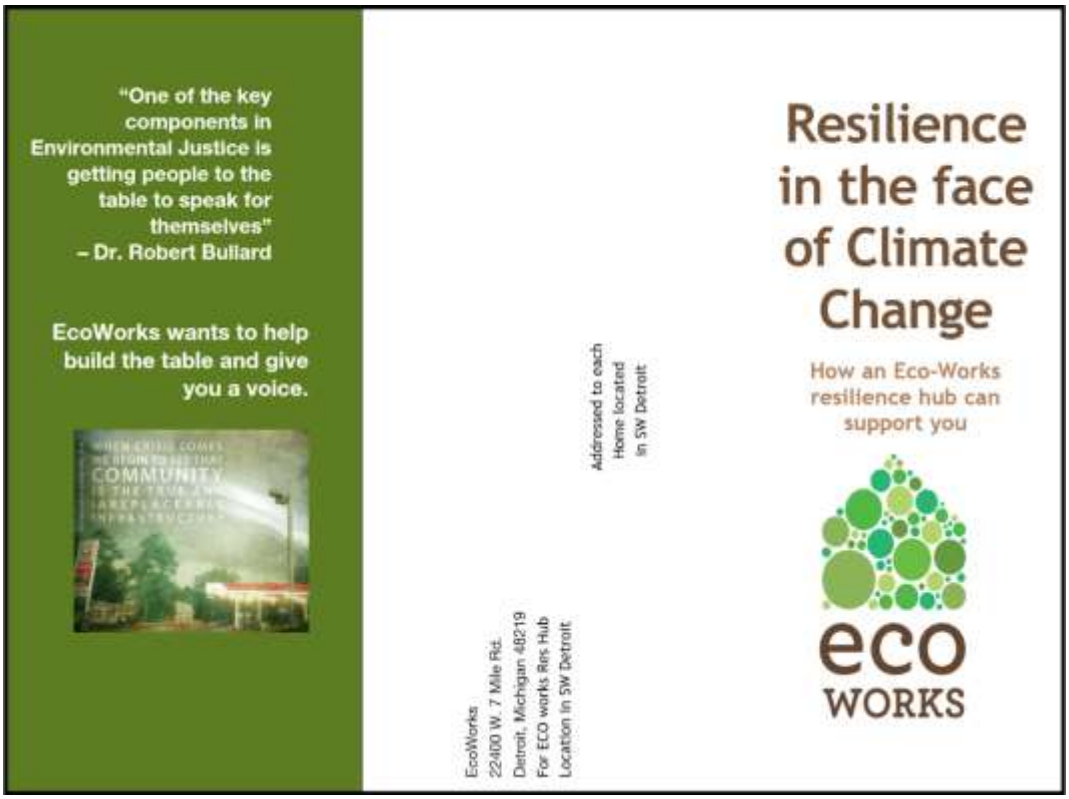
		39. Develop a greenhouse gas assessment and climate action strategy 40. Increase the adoption of solar PV 41. Enhance energy and water efficiency at City-owned facilities 42. Launch Mayors' Challenge Program for Commercial Buildings 43. Develop an electric vehicle infrastructure strategy

Appendix B – Existing Detroit Resilience Hubs

RESILIENCE HUB	LEAD ORGANIZATION	NEIGHBORHOOD(S) SERVED
STOUDAMIRE WELLNESS HUB	Eastside Community Network (ECN)	Eastside of Detroit
BAILEY PARK	Bailey Park Neighborhood Development Corporation	McDougall-Hunt
LENOX HILL	City of Detroit, ECN	Jefferson Chalmers
BRILLIANT DETROIT CHANDLER PARK HOUSE	Brilliant Detroit	Chandler Park

Appendix C – Community Education Materials

Mailer:



Flier (Trifold):

"One of the key components in Environmental Justice is getting people to the table to speak for themselves" – Dr. Robert Bullard

EcoWorks wants to help build the table and give you a voice.

At EcoWorks we take care of people, by taking care of buildings.

Much like a plant or a person, a building has a life. A life that, although not living and breathing, serves and impacts living and breathing things every day. Their safety, their warmth, their health, the environment around them.

Together we can build a more resilient community through resilient buildings and what is housed inside them, you.

Contact Us

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Community Resilience in the face of Climate Change

How can a resilience hub can best support you and your community?

eco WORKS

What challenges do you have in your community?

Have you experienced high utility bills, water shut offs, flooding and higher than usual temperatures? Are abandoned buildings and empty lots getting you and your property value down? Do you struggle to use computers or get around town? Are you struggling to overcome these challenges?

What things might be most helpful in overcoming these?

A community is only as strong as its weakest link, and for too long that link has been overlooked, abandoned or flat out ignored. Now is the time to overturn that rock and raise your hand to build the community support system you always dreamed of by helping to design a Resilience Hub.

What is a Resilience Hub?

Resilience Hubs are community-serving buildings that support residents, coordinate communication, distribute resources, and reduce carbon pollution while enhancing quality of life.
EcoWorks first Resilience Hub will be a one-stop-shop for community information and support by bringing together the groups and services you already know, to help you overcome challenges and support your resilience.
Resilience Hubs are not a new concept but are a new way to approach equity-based climate resilience by "shifting power to neighborhoods and residents, provide opportunities to address root causes of disproportionate exposure and sensitivity to climate impacts, and enhance communities' capacity to adapt." – resilience-hub.org

So, we ask you to share your story, speak up and build momentum to create our own Resilience Hub

What things might be most helpful in supporting you in overcoming challenges and obstacles? EcoWorks wants to hear them! No idea is too big or too small.

Example Offerings

- Emergency support
- Social support services
- Intergenerational activities
- Health and wellness workshops
- Workforce development
- Solar energy/ storage
- Tool Library
- Laundry
- Business incubator
- Auto and Bicycle repairs
- *Your idea here!!!!*

Pull out your camera and join the conversation, simply point your camera at the QR code below and click the link to join the conversation.

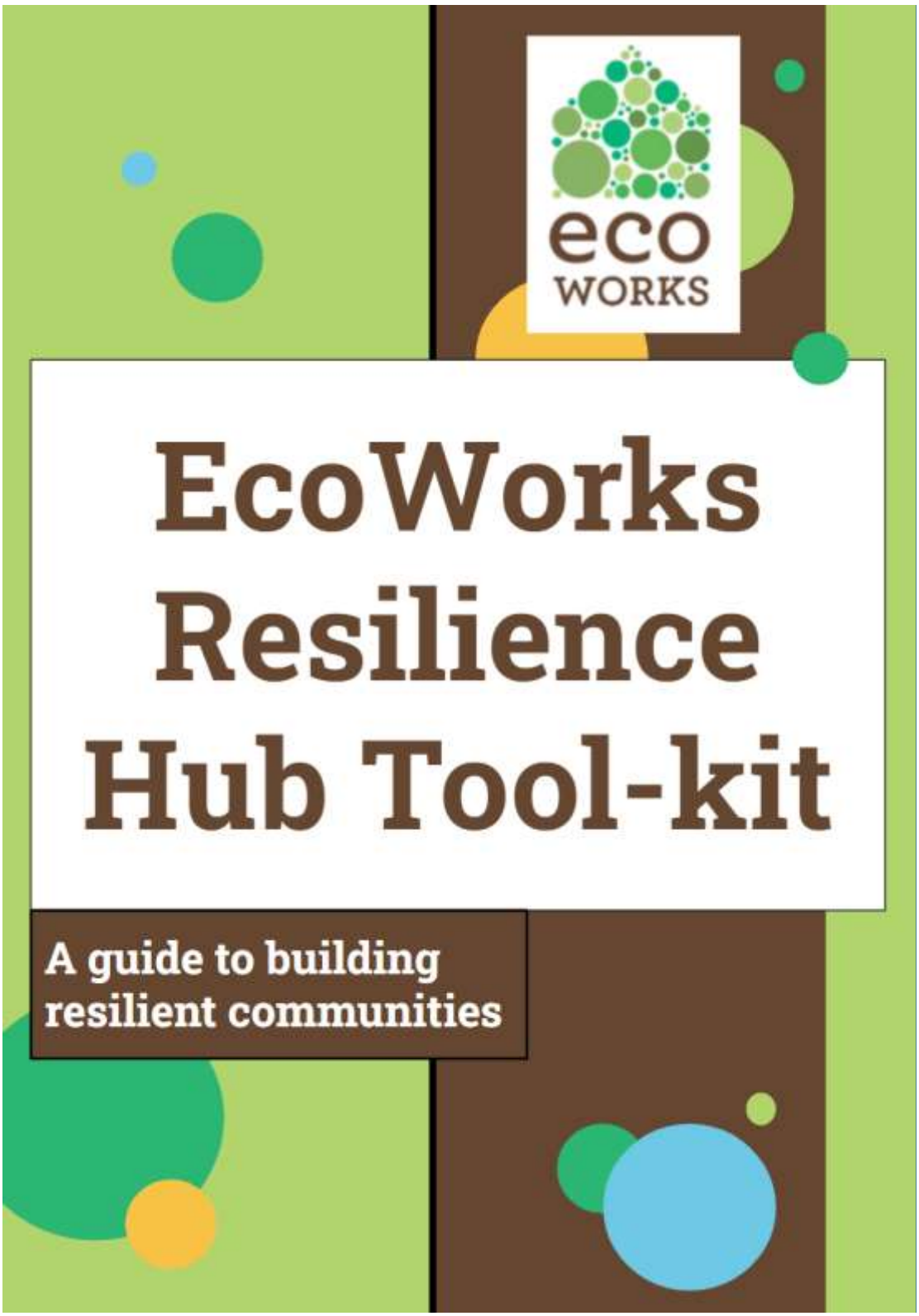
SCAN ME

If you feel more comfortable, please reach out to your trusted community partners who are helping to design the best Resilience Hub for your community

Essential Partners

- Hope Village Block Club
- Castle Rouge Civic Association
- Yorkshire Woods Block Club
- Berg Lasher Block Club
- Bridging Communities

Toolkit (Cover):



Appendix D: Summary of Funding and Partnership Opportunities

Funding Source	Funding Type	Description	Link to Source
Carbon Offset Guidance	Networking	General knowledge and background on carbon offset programs	source
Clean Energy Group (CEG)	Consulting	Solar systems implementation support, Education materials and tool kits	source
D4 - Metro Detroit	Consulting	Strives to make Metro Detroit more equitable, prosperous, and sustainable. Support of on-the-ground campaigns and hone leadership skills of community leaders	source
Department of Energy - State Energy Program	Grant	Maximize the benefits of energy efficiency and renewable energy	source
Department of Energy - Weatherization Assistance Program	Grant	Reduce energy costs for low-income households through energy efficiency	source
Department of Energy	Training	Solar Training and Education for professionals funding program	source
DNR of Michigan	Grant	Grants that range from tree planting to education grants	source
DOE NREL Connected Communities	Grant	A Multi Building Energy Management Approach to support community microgrids	source
DOE: Federal Investment Tax Credit	Credit	Federal tax credits for solar installations that can support structural improvements and stabilization	source
Drawdown Communities	Consulting	Support communities to identify concrete, collective actions to help adopt and scale climate solutions	source
Energy Conservation Source	Consulting	Solar Systems implementation for commercial buildings	source
EPA- Green Infrastructure	Grant	Coronavirus State and Local Fiscal Recovery Funds with "substantial flexibility"	source

FEMA: BRIC: Building Resilient Infrastructure and Communities	Grant	Funding to support hazard mitigation projects, reducing the risks they face from disasters and natural hazards	source
FEMA: Hazard Mitigation Assistance	Grant	Hazard mitigation is any sustainable action that reduces or eliminates long-term risk to people and property from future disasters. Possibility of being used for microgrids	source
Forest Service Research	Grant	Funding and support for forest and tree canopy rehabilitation	source
Green-e	Consulting	Clean energy verification program. Supports Carbon Offset verifications	source
Grid Alternatives	Funding	Build community renewable power grids to advance economic and environmental justice	source
Groundwork of Michigan	Consulting	25 years' experience of creating "ground up" community resilience	source
Hammond Climate Solutions: Solar Moonshot program	Grant	Support nonprofits transition to 'clean' energy	source
HUD: Energy Efficiency	Grant	Community partnerships and single-family home retrofits	source
HUD: Community Development Block Grant Program	Grant	Funding for communities to provide decent housing and suitable living environment	source
Interstate Renewable Energy Council	Consulting	Offers regulatory, community and workforce training programs	source
Living Future, Net Zero Buildings	Consulting	Networking, Living Building Challenge, Living Community Challenge	source
Michigan Center for Resilient Communities	Fundraising	Networking, Fundraising and Podcast	source
Michigan Strategic Fund	Grant	Funding to promote economic development and create jobs	source
Midwest Renewable Energy Association (MREA)	Networking	Solar System Implementation support with trainings, group purchases. Energy Fair	source

MISaves Green Bank program	Loan	Loans to support green energy transitions	source
NREL Climate Neutral Research Campuses Carbon Offsets	Networking	Educational materials for creating your own local carbon offset program	source
NREL's distributed and small wind research: MIRACL program	Networking	The Microgrids, Infrastructure Resilience, and Advanced Controls Launchpad (MIRACL) Support development for more cost effective and grid-friendly wind power. Looking for partners	source
Office of Climate and Energy	Grant	Funding for renewable energy, energy efficiency, economic growth, education, and training	source
RE-volv	Funding	Helps non-profits go solar through connecting donor advised funds, impact investors and foundations with recoverable grants	source
Smart Energy Decisions	Consulting / PPA	Funding for renewable energy projects that are paid back through energy savings	source
Solar Energy Innovation Network	Grant	Grant and consulting to help communities adopt solar energy	source
Solar Energy International	Training	Online Training Programs for Green infrastructure jobs	source
Solar United Neighbors	Consulting	Solar systems implementation support, community action and engagement. Could bring to Michigan	source
SolaRise	Funding	Crowd Sourced fundraising platform	source
State of Michigan's Department of Environment, Great Lakes, and Energy (EGLE)	Grant	Revolving grant programs and new MIEJScreening tool	source
Urban Sustainability Directors network - USDN	Networking	Networking between hubs and best practice sharing	source
US Resilience Funding ToolKit	Resources	Toolkit for best practices and funding	source

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