Washtenaw County Greenhouse Gas Inventory and Resilience Hub Strategy

Dow Final Report 2020

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Executive Summary

In 2019, Washtenaw County announced its goal for county operations to develop a Climate Action Plan and to have net-zero emissions by 2035. To help meet these goals, our Dow Fellows team worked with the Washtenaw County Commissioner's Office to gather information on climate mitigation and adaptation, and we used this information to develop strategies that can be used in the Climate Action Plan. After speaking with our client about the county's needs, our team decided to focus on Washtenaw County's parks and nature preserves because of a current gap in knowledge for these areas and their role as community centers. To complete this project, we engaged in sub-national climate action training modules, literature reviews to gather background knowledge regarding climate mitigation and adaptation strategies, and informational interviews with various stakeholders to learn more about community needs and how climate resilience strategies can be effectively integrated into current county operations.

Our activities included 1) working with the International Coalition for Local Environmental Initiatives (ICLEI) to conduct a greenhouse gas emissions inventory for Washtenaw County's parks and nature preserves, 2) developing a Qualtrics survey to gather community input on how the county can better serve their needs during climate-related crises and times of normalcy, 3) creating a budget and strategy for planting trees at Sharon Mills County Park, and 4) developing strategies for climate resilience hubs, facilities that can serve the community during times of crisis. Our resilience hub strategies included information on resilient power and structure, vulnerability assessments and accommodations for vulnerable populations (with a focus on the homeless population), community engagement, food security, and health programming. Our team provided our client with graphs showing greenhouse gas emissions, a survey draft that will be delivered to Washtenaw County residents after the COVID-19 pandemic ends, and a full report detailing our research and strategies on climate resilience hubs.

Recommendations focused on Meri Lou Murray Recreation Center (MLM) as a case study for becoming one of the first climate resilience hubs in Washtenaw County, but the recommendations can also be applied to resilience hubs in other locations. These products provided our client with a baseline of greenhouse gas emissions from county parks in order to inform future mitigation strategies, as well as information on community needs that can be used for future adaptation strategies. Resilience hub recommendations can be utilized in the event of a climate-related hazard, but can also serve Washtenaw County more generally as an information hub on climate change and a facility that can serve the community during other unexpected crises, such as the COVID-19 pandemic. Finally, the trees planted at Sharon Mills County Park will help to offset carbon emissions from county operations. Together, these deliverables address both climate mitigation and adaptation, bringing Washtenaw County one step further in the development of its Climate Action Plan.

Acknowledgments

Introduction & Project Background

Washtenaw County is home to about 370,000 people in rural and urban settings. Rapid advancement in technology and increased human activities around the world is leading to irregularity in climate. Changes in climate alter the atmospheric balance and cause severe temperatures, flood hazards, and other unintended disasters. In response to these climate hazards, the 2019 Washtenaw County Board of Commissioners declared its intent to eliminate greenhouse gases by 2035 and to develop a Climate Action Plan with mitigation and adaptation strategies for the community. The goal of this action plan is to decrease use of fossil fuels, use more clean energy resources, offset carbon emissions through proactive efforts, and implement resilience strategies to protect the community and its residents (Washtenaw County, n.d.). While other neighboring towns and counties are addressing the climate crisis, our project scope is focused on Washtenaw County's efforts.

Due to the increasing complexities of communities, human-caused and natural disasters are on the rise. Factors like globalization, climate change, and urbanization can increase costly disaster-related risks that can result in significant damage and disruption to communities, infrastructure, economy, and availability of social services. Mitigating these risks calls for an approach that integrates disaster preparedness and actions that strengthen communities on a daily basis (DHHS, 2015). Thus far, community resilience has focused solely on the survival of individuals and social capital development at the expense of understanding the dynamics of social-ecological conditions that are likely to greatly influence post-disaster outcomes (Finucane et al, 2019).

In response to the urgency of implementing a safe climate action and emergency preparedness plan in Washtenaw County, our team collected data on greenhouse gas inventory over a period of time, drafted a survey to assess community needs in the event of a climate crisis, and made recommendation strategies for climate mitigation and adaptation. In addition, we explored the potential for resilience hubs in Washtenaw. We proposed resilience hub strategies as a measure to reduce the likelihood of dangers posed to community members in the event of a disaster and in times of normalcy. A community climate action plan in Washtenaw County is essential for rapid recovery from disruptive events such as natural disasters and pandemics. The following three subsections outline background information relevant to our three deliverables.

Greenhouse Gas Emissions Inventory: The International Council for Local Environmental Initiatives (ICLEI) describes itself as a "global network of more than 1,750 local and regional governments committed to sustainable urban development." Washtenaw County purchased an ICLEI subscription and asked us to train ourselves in the software and input all annual emissions data for the Washtenaw County parks system to create an emissions baseline for future carbon tracking. We traced their emissions using electricity records.

Community Survey: Community input and community research is integral to resilience hub development. Prior to the COVID-19 pandemic, our team had intended to conduct community focus groups in Washtenaw County to evaluate community needs and inform our resilience hub recommendations. We felt the best way to build our recommendations for the development of a resilience hub at Meri Lou Murray (MLM) Recreation Center was to directly involve the most important stakeholder: community members.

As the pandemic unfolded, we were forced to reevaluate how we went about this and what would be most useful to our clients at Washtenaw County Park and Recreation. After extensive conversations with our client, we decided to develop a Qualtrics survey for future use when Washtenaw County is closer to conducting community changes. This granted our client added flexibility to tailor the survey to unforeseen future needs when the project mission becomes more concrete. Finally, a survey is more easily distributed, has lower barrier to entry, doesn't promote spread of COVID-19, and is more standardized compared to focus groups. Our hope is that this survey skeleton can also be utilized for future resilience hub development in other regions of Washtenaw County, outside of MLM.

Resilience Hubs: Resilience hubs are a community tool increasingly promoted by federal and local governments that play vital roles in the community during non-crisis and crisis times. They engage community members on best climate preparedness practices, sustainable climate training, and workshops. Resilience hubs, as a resilient infrastructure, are the foundation and support of emergency management, the reduction of climate pollution, and enhanced social connectedness before and during disruptive effects (Baja, 2019).

Our client, Washtenaw County Commissioner Sue Shink, identified MLM as the park facility that should serve as a case study for a possible resilience hub. MLM has a large existing infrastructure (approximately 25,000 square feet of mixed-use space) and is slated to undergo construction in 2021, making resilience hub programming a concrete and near-term possibility for the facility. We examined community resiliency and proposed recommendations for MLM under the following categories: resilient power and structure, vulnerability assessment and accommodations for the homeless population, community engagement, food systems, and health and resilience programming.

Resilient Power & Structure. We explored options for MLM to generate electricity, have reliable back-up power in the event of a natural disaster and grid-outage (i.e., DTE service fails), and use sustainable building materials to increase the building's structural resilience, including carbon negative materials.

Vulnerability Assessments & Accommodations for the Homeless Population. In the absence of a full vulnerability assessment for Washtenaw County's population, we decided to focus on how MLM can better serve the homeless population. This vulnerable population experienced several obstacles to good health and well-being especially during the COVID-19 pandemic.

Community Engagement. Resilience hubs require engagement and direct partnerships with local community organizations and leaders. Engagement with local actors provides an opportunity for more transparent information, salient policy-making, and greater credibility and trust between actors (Soares et al., 2012). Community-driven frameworks and equity should be addressed at every stage throughout the planning, development, and implementation of resilience hubs.

Food Security. While MLM serves a relatively affluent population with few food security concerns compared to other areas, the development of a resilience hub could still be leveraged to benefit food insecure individuals while improving the overall stability of the food system in neighboring regions. Food insecurity is defined as "lack of access, at times, to enough food for an active, healthy life for all household members and limited or uncertain availability of nutritionally adequate foods" (USDA, 2020). Efforts were focused on improving the region's food security through the following pillars outlined by the Food and Agriculture Organization (FAO): availability, accessibility, utilization, and stability (Harris and Spiegel, 2019).

Health & Resilience Programming. Resilient communities promote individuals and their community's physical, behavioral, and social health to strengthen communities for daily and extreme challenges (DHHS, 2015). The proposition to partner with health organizations in the development of a resilience hub at MLM will bridge the accessibility gaps among populations and bring the needed care to vulnerable populations.

Methods

Client Engagement: Our team worked collaboratively with many team members of Washtenaw County Parks and Recreations to ensure we satisfied their needs. Frequently, we would end meetings with our clients asking "What is your dream deliverable as a result of our work?" This confirmed that we met client needs and established frequent checkpoints for us to get feedback to pivot if needed (Appendix A).

Greenhouse Gas Emissions Inventory: ICLEI was a relatively new purchase for Washtenaw County, and few employees were trained in how to use the software. After completing several self-guided, online trainings, our team was ready to input all parks emissions data. We received a document from the parks department containing all 2019 electricity usage data, we input each park's annual KwH demand; we then input the electricity generation method (natural gas, coal, solar, etc). ICLEI generated annual emissions graphs, reports, and more. We shared these with our client, Washtenaw County Commissioner Sue Shink. The nine parks audited include: Parker Mill, Parkers Admin, Rolling Hills, MLM, Field Operations, Park Lyndon, Independence Lake, Sharon Mills, and Staebler Farm. Due to limited data, scope 1 emissions calculations were unavailable. Scope 1 emissions are those that come directly from the activity of on-site processes, such as burning coal to make steel. Conversely, scope 2 emissions are indirect emissions from the generation of purchased electricity, steam, heating, and cooling used by an organization. The parks system did not have any activity on site that directly contributed to GHG emissions. Their purchase of electricity falls under scope 2 emissions by definition.

Community Survey: To generate the community survey, our team utilized an online Qualtrics survey where we could each edit and add questions. First, we conducted research on best practices for demographic questions on race, ethnicity, and household income. Secondly, we each conducted extensive literature review on assigned topics in resilience hub development to determine best practices for measuring community resilience, assets, and needs. For example, after research it was concluded that food security is the best measure of food system resilience (Harris and Spiegel, 2019). We incorporated the United States Department of Agriculture (USDA) validated household food security questionnaire in our final survey draft.

Resilience Hubs: Our team reviewed related literature on resilience hubs and examined some case studies that could serve as an excellent model for MLM (Appendix B). We examined what the COVID-19 pandemic revealed about community resilience in Washtenaw County and how developing a resilience hub could mitigate these constraints. This concluded in a 35-page final report for our client through which we proposed recommendations under five categories of community resilience as outlined below.

Resilient Power & Structure. Under the resilient power and structure component of MLM, we examined its electricity usage to determine its needs as a resilience hub in order to provide cost effective energy storage and build structural resilience in effectively handling emergencies.

Vulnerability Assessments & Accommodations for the Homeless Population. To better understand the needs of the vulnerable and homeless population, we spoke with Teresa Gillotti, the director of Washtenaw County's Office of Community and Economic Development (OCED). We learned that 370 people are currently experiencing homelessness in Washtenaw County (OCED, 2020). Findings from the meeting with Teresa Gilloti informed our survey questions to understand how to better serve this target population.

Community Engagement. Since the opportunities to engage directly with Washtenaw County residents was limited due to COVID-19, alternative methods of engagement in the development of a resilience hub were considered. The surveys that we developed could be widely distributed since focus groups were not a possibility. Improved community engagement can foster connection during times of crisis and identify resources and networks available to protect the community.

Food Security. To develop resilience hub recommendations for food systems, an extensive literature review was conducted on food systems case studies, methods for evaluating food system resilience, and best practices. Additionally, community features of Washtenaw County's food system were evaluated. Various stakeholders were communicated with including *Project Grow,* MLM, and OCED. Food security is considered the best measure of food system resilience and was evaluated in our recommendations (Baja, 2019).

Health & Resilience Programming. Measures of community health and resilience programming can be accessed based on indicators that include but are not limited to current health status of the community members, lifestyle behaviors and preventive services that determine future health, and life satisfaction (Baja, 2019). To develop recommendations, we also conducted extensive literature on community resilient health case studies, access to healthcare services, and social determinants. One of the most commonly used indicators for measuring community resilient health in the United States is the Gallup-Healthways Well-Being Index Questions (The Gallup, 2007). Based on this index, we incorporated questions on physical, emotional health, and basic access that seek to explore areas with the greatest medical needs in the survey draft for Washtenaw County.

Results and Recommendations

Greenhouse Gas Emissions Inventory: We shared out our ICLEI reporting data, and emphasized that two parks in particular had enormous carbon footprints: MLM and Rolling Hills water park (Appendix C). The parks each use more than 500,000 KwH annually, generating approximately 354 - 700 metric tons of carbon emissions per year -- the carbon equivalent of 95,000,000 smartphone charges, 1,600,000 miles driven in a typical passenger vehicle, or 3 railroad cars of coal. We recommended that the client continue to audit its emissions data and build off the 2019 baseline we entered into ICLEI. We also recommended that the client install solar panels at MLM park in an effort to reduce MLM's carbon footprint (see Resilience Hub Power and Structure section below). Finally, based on our data, we teamed up with the Parks Department to purchase ~170 trees to be planted locally, which will sequester approximately 340 tons of CO_2 through their lifetime. The client had a funding gap for their reforestation work in Sharon Mills (Appendix D). We provided funding to help complete the project.

Community Survey: We distributed the skeleton survey to Washtenaw County officials. This grants the ability to modify the survey for future needs and implement the survey in different regions of the community with future goals of developing a resilience hub in every community.

Resilience Hubs: Our recommendations included strategies for converting MLM into one of Washtenaw County's first climate resilience hubs, supported by evidence-based research and case studies from other sub-national climate resilience projects. Recommendations also provided input to plan for future resilience hubs. The report we provided our client with also included resources on local organizations and researchers conducting related work as well as information on how the resilience hub is relevant to the COVID-19 pandemic and could provide support to Washtenaw County in future crises. We provide a short summary of our recommendations below. A full table with these recommendations can be found in Appendix E.

Resilient Power & Structure. Our recommendations for resilient power and structure in MLM include both mitigation and adaptation strategies. We recommend the implementation of carbon-free, off-grid heating and energy sources. These changes will both reduce fossil fuel use and ensure systems can provide power in the event of a power failure. A set of calculations estimated the amount of energy that would be needed in order to accommodate the number of individuals a climate resilience hub would serve, and it provided cost estimates for adding solar panels at MLM to meet these energy needs. Information was also provided on back-up systems, such as batteries, compressed air energy storage, and diesel generators in terms of their comparative cost, reliability, and environmental sustainability. Specifically, we calculated that MLM could fit approximately 600 solar panels on their roof, and with redundant back-up systems such as diesel generators and batteries, Washtenaw Parks would be facing approximately $750,000 in upgrade costs. Additionally, green construction strategies, such as geothermal energy and carbon-negative concrete should be used in MLM's renovations, and the facility should be built to withstand floods through liquid tight conduits for communications and electrical cable systems, weather-proof electronics, and elevation of essential equipment.

Vulnerability Assessments & Accommodations for the Homeless Population. We outlined the process of conducting a vulnerability assessment for Washtenaw County. This process would include analyzing exposure, sensitivity, and adaptive capacity. Possible climate-related exposures that are possible in Washtenaw County include extreme changes in temperature and/or precipitation. Sensitivity is determined by factors that may cause inequitable distribution of impacts (e.g., socioeconomic status, food and housing security, mobility, access to health services). Finally, adaptive capacity of residents is based on several factors (e.g., financial resources, community networks, technology). We provided an overview of these concepts and resources to conduct an assessment, but we also recommend that Washtenaw County conduct a more in-depth analysis in order to determine where and how future resilience hubs can most effectively serve the most vulnerable residents. Because COVID-19 has revealed the vulnerability of the homeless population in Washtenaw County, we also included recommendations for how MLM can house the homeless population during climate hazards. These recommendations can also be applicable to other vulnerable groups, such as seniors.

Community Engagement. Since resilience hubs are meant to provide support for communities, we recommend that Washtenaw County engage with residents and local organizations as much as possible throughout the planning, implementation, and evaluation of MLM as a resilience hub. We provided a list of local organizations Washtenaw County should partner with as well as a set of ideas for engaging with them through focus groups, town halls, visioning sessions, workshops, and multi-stakeholder working groups. We also recommended that MLM draw upon existing community programs at MLM, such as summer camps, by making these programs more accessible to underserved communities and relevant to sustainability.

Food Security. Our food system recommendations include information on how to expand the community garden to provide food to the homeless population and other food insecure groups. To do so, we suggest converting the kitchen on the ground floor of MLM into a food pantry, collecting and using community composting for food waste reduction, expanding community gardens, and following guidance from the United States Agency for International Development for ensuring food distribution during crises. We also recommended a social media campaign to encourage communication of new services to vulnerable members of the community.

Health & Resilience Programming. Finally, resilient health systems can also support daily benefits and positive health outcomes before a natural disaster occurs; this improved performance during good and bad times is called "resilience dividend" (Kruk et al, 2015). To improve access to basic medical needs during an emergency or a natural disaster and foster a resilient health system, we recommend that MLM incorporate healthy living programs such as cooking classes, exercise classes, and walking groups. MLM should also provide tips that promote healthy behaviors, collaborate with nonprofit organizations to expand the reach of the resilience hub and provide health services to a wider range of residents, engage at-risk individuals in developing health and wellness programs, and build social connectedness among community residents.

Project Impact

The deliverables created through this project will provide a foundation for Washtenaw County as it develops its Climate Action Plan; our recommendations for mitigation, adaptation, and community engagement can be integrated into the final plan.

The greenhouse gas emissions inventory provides baseline data for understanding which parks and nature reserves throughout the county should be the focus of future mitigation strategies. We recommend that the Climate Action Plan focus on reducing CO_2 emissions from MLM and Rolling Hill Water Park, which both emit more than 400 metric tons of CO_2 in 2019 (Appendix C). Our strategies for using MLM as a resilience hub include information on the feasibility of using solar panels for energy to help facilitate this, and the strategy for planting trees in Sharon Mills County Park will offset roughly 340 tons of carbon per year once the trees reach maturity. Silver maples, for example, which are native to this area, capture 25,000 pounds of carbon in their 55 year lifespan.

The resilience hub includes concrete recommendations for how to convert MLM into one of Washtenaw County's first climate resilience hubs. Since MLM is currently being redeveloped, these recommendations can easily be integrated into ongoing plans. The recommendations will help Washtenaw County residents adapt to climate change through food and power access, community engagement, and health programming. Additionally, we expect that the resilience hubs can be used not just in times of climate-related hazards, but also throughout the year as an information hub and during other crisis events (such as the COVID-19 pandemic).

In order to ensure that the resilience hub would benefit a vulnerable population, we included information on how MLM can assist Washtenaw County's homeless population. Washtenaw County currently has 370 people experiencing homelessness who could benefit from the features of the resilience hub. The resilience hub plans include recommendations for food distribution, shelter, and community engagement/communications in order to meet this population's needs. The community survey will also help to serve Washtenaw County's population more directly by providing an outlet for community members to provide input.

In the future, a second phase of this project could focus on completing a full vulnerability assessment for Washtenaw County to provide critical information about the climate-related exposures Washtenaw County may face and how their effects may be distributed among the population. This information can guide the creation of future resilience hubs; by determining which populations are most vulnerable to climate change, Washtenaw County can better understand where resilience hubs should be located and what features they should include in order to best serve the community. Although we selected MLM for our project because of the timeliness of its redevelopment, Washtenaw County will need to strategically decide where to create future resilience hub sites in order to benefit the most vulnerable communities.

Appendix

Appendix A. Client Contact Information.

Client: Sue Shink
Position: Washtenaw County Commissioner, District 2
Phone: 734-222-6850
Email: shinks@washtenaw.org

Appendix B. Meri Lou Murray Recreation Center, the site we used as a case study for our climate resilience hub strategies and recommendations. Photo courtesy of Washtenaw County Parks and Recreation and Fred Golden.
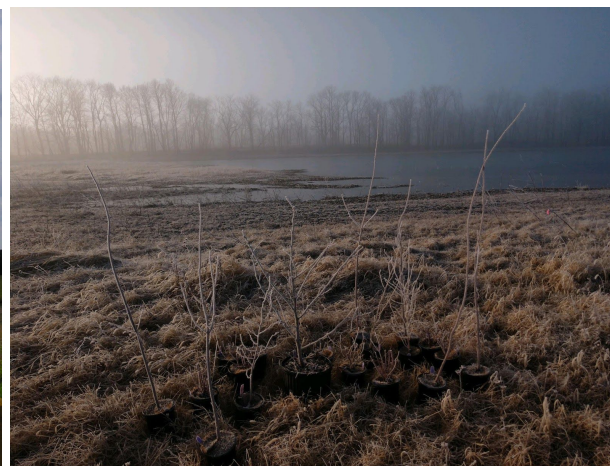
Appendix C. ICLEI CO_2 Emissions: MLM emits the most carbon dioxide by far.
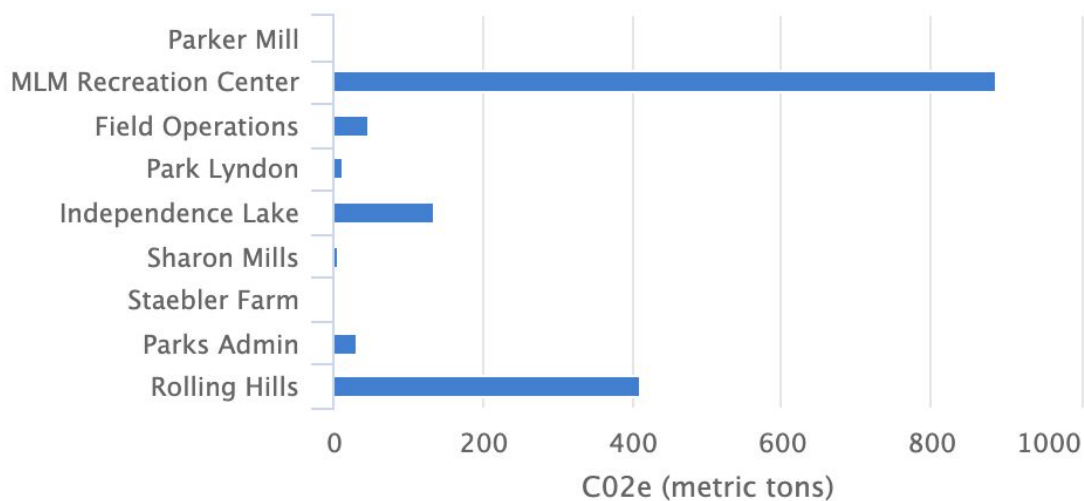
Appendix D. Site in Sharon Mills County Park where trees were planted to offset carbon emissions (left) and newly planted trees (right). Photo courtesy of Washtenaw County Parks and Recreation.

Appendix E. Climate Resilience Hub Recommendation Summary. These were expanded upon in great detail in our final resilience hub report delivered to our client.

Vertical	Recommendation
Resilient Power and Structure	Purchase solar panels
Resilient Power and Structure	Invest in duplicate back-up systems
Resilient Power and Structure	Install a geothermal heating / cooling system
Resilient Power and Structure	Invest in sustainable building materials
Vulnerability Assessment & Homeless Population	Conduct a vulnerability assessment for Washtenaw County
Vulnerability Assessment & Homeless Population	Identify locations and features for future resilience hubs
Vulnerability Assessment & Homeless Population	Build on existing adaptive capacity assets
Vulnerability Assessment & Homeless Population	Address sensitivities revealed by COVID-19
Vulnerability Assessment & Homeless Population	Gather data on the needs of the homeless population
Vulnerability Assessment & Homeless Population	House the homeless population in MLM
Community Engagement	Develop partnerships for cross-sectoral collaboration
Community Engagement	Create strategies to engage all community members
Community Engagement	Assess effectiveness through surveys and focus groups
Community Engagement	Utilize existing community programs at MLM
Food System	Expand community garden
Food System	Food pantry onsite
Food System	Community composting onsite
Food System	Pandemic food distribution planning
Food System	Outreach media campaign
Health and Resilience Programming	Conduct needs assessment
Health and Resilience Programming	Strengthen and promote access to healthcare services
Health and Resilience Programming	Expand communication and collaboration
Health and Resilience Programming	Engage at-risk individuals in planning and developing resilient health and wellness programs
Health and Resilience Programming	Build social connectedness

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