CLEVELAND

Climate Resilience & Urban Opportunity Plan

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IN PARTNERSHIP WITH:

City of Cleveland, Mayor's Office of Sustainability
Cleveland Urban Design Collaborative
University at Buffalo
Kent State University

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1. EXECUTIVE SUMMARY

Cleveland, Ohio is taking an asset-based approach to planning for climate change. Some of the local assets we're building on include:

- A robust network of community development corporations that help to shape development efforts at the neighborhood level and public policies citywide.
- A dedicated team of neighborhood climate ambassadors to lead community outreach and engagement efforts.
- Established partnerships with the city, the county, the regional sewer district, faith-based institutions, and other non-profit organizations in advancing neighborhood-scale climate adaptation strategies.
- Extensive weatherization and energy efficiency programs–Cleveland has one of the earliest and most effective home weatherization programs in the country.
- A large inventory of vacant land (much of which is held in city and county land banks) that can be used to help buffer residents from the adverse impacts of climate change, while fostering more sustainable and resilient development in the future.

For Cleveland residents, adapting to the effects of climate change will require specific interventions that respond to our unique challenges. Temperatures in Cleveland are rising faster than in other Great Lakes cities, and the city is facing increased flooding risks and storms of greater frequency and intensity. Cleveland also has existing land use patterns and social conditions that exacerbate the adverse effects of climate change, particularly for low-income neighborhoods and communities of color.

Cleveland Neighborhood Progress, the Cleveland Urban Design Collaborative, and the University at Buffalo worked with a broad range of community stakeholders to complete this plan. The proposed projects, programs, policies, engagement strategies, and research recommended in the plan will help to lessen overall demand for energy, anticipate and prepare for climate changes, and foster social cohesion. The plan includes a detailed assessment of the anticipated effects of climate change in the Midwest, along with mapping and analysis of Cleveland's most vulnerable neighborhoods.

The plan builds on current local efforts to address the impacts of climate change, including *the Cleveland Climate Action Plan* (CAP), *Neighborhood Climate Action Toolkit,* and *Cleveland Climate Action Fund*. The plan also advances the recommendations of existing neighborhood plans, the city's *Complete & Green Streets* ordinance, and the *Re-imagining a More Sustainable Cleveland* framework for vacant land reuse. It also aligns closely with the on-going efforts of the Northeast Ohio Regional Sewer District to manage stormwater and reduce combined sewer overflows into Lake Erie.

The plan advocates for the implementation of innovative, community-driven strategies. We will continue to work closely with community development corporations in four target neighborhoods to coordinate community engagement and outreach efforts. Our goal is to empower a cohort of Neighborhood Climate Ambassadors to organize residents and help neighborhood-based grassroots organizations capitalize on funding opportunities made available through the Kresge Foundation, the City of Cleveland's Climate Action Fund, and the George Gund Foundation. The plan organizes the strategies generated from Ambassador-led community meetings by the specific outcomes these ideas are intended to achieve—particularly, reducing flooding and heat-related mortality, and addressing rising utility costs and anticipated energy shortages. Through strategies detailed in this plan, Cleveland and its residents will be better prepared to withstand the impacts of climate change.

2. OVERVIEW

Climate change has different implications in the Great Lakes region than along the coasts. Instead of dealing with sea level rise, we face higher temperatures and more high heat days. According to the Great Lakes Integrated Sciences and Assessments Program (GLISA), temperatures are rising three times faster in Cleveland than elsewhere in the US. We also face an increased number of heat waves, increased flooding risks, and storms of greater frequency and intensity.

Cleveland has social conditions and land use patterns that may exacerbate the adverse effects of climate change. At the regional level, sprawling development without population growth has led to concentrated poverty in core city neighborhoods, redundant infrastructure, an increase in impervious surfaces, and growing economic and racial segregation. Climate-related challenges will not be experienced uniformly across the city and region. Topography, tree cover, development patterns, and social factors lead to geographically specific vulnerabilities, documented in the maps in Appendix E.

TARGET NEIGHBORHOODS In this plan, we focus on four neighborhoods that are representative of conditions found in Cleveland and other Great Lakes cities:

- *Slavic Village:* As the neighborhood at the epicenter of Cleveland's foreclosure crisis, Slavic Village has many vacant houses and vacant lots, along with a high concentration of low-income households. Neighborhood assets include excellent transit and bike infrastructure and on-going programming that promote active lifestyles.
- *Central-Kinsman:* Perhaps the most distressed neighborhood in the city, Central-Kinsman has a high poverty rate; many abandoned buildings, vacant sites, and brownfields; and a sparse tree canopy. The neighborhood is home to one of the city's two eco-districts. It has a strong community development corporation with innovative programs to increase food access/food security and reduce public health disparities. The Cuyahoga Metropolitan Housing Authority has made significant upgrades to public housing in the neighborhood in recent years.
- *Glenville:* This neighborhood has some of the oldest housing in the city, including grand mansions, multi-family buildings, and small houses, along with pockets of new residential development. The neighborhood has highly engaged residents who meet at regularly scheduled Network Nights in order to advance local projects and address emerging concerns.
- *Detroit-Shoreway:* This neighborhood is economically diverse, including some of the poorest and most affluent households in the city. It has excellent transit access and a thriving cultural district. It is home to the city's other (and original) eco-district.

PLANNING APPROACH Our planning approach integrates local knowledge and community-based ideas with scientific expertise to help determine where programs and interventions will be most effective in combatting the adverse impacts of climate variability. Under the leadership of Cleveland Neighborhood Progress, four community development corporations each recruited four residents as neighborhood climate ambassadors. Four at-large climate ambassadors were also recruited to help extend this planning process beyond the four target neighborhoods.

The climate ambassadors received training in basic climate science and mitigation/adaptation strategies (see www.youtube.com/watch?v=EuJRkPXaKdY). They then served as resources throughout the planning process, recruiting participants for community workshops and helping to identify and prioritize ideas for projects, programs, policies, and future research that would help advance climate resiliency at the neighborhood scale.

RESEARCH Scientists from Kent State University (KSU), the University at Buffalo (UB), and the University of Michigan's Great Lakes Integrated Sciences + Assessments Center (GLISA) developed training materials for the climate ambassadors and conducted research as follows:

Historical Climatology (Appendix D) The climatology review prepared by GLISA documents the changes underway in Cleveland, including:

- *Rising average temperatures:* Annual average temperatures warmed by 2.4°F from 1956-2012, faster than the national and global rates. Average low temperatures have warmed faster than high temperatures.
- *Longer freeze-free season:* The freeze-free season (growing season), lengthened by 20 days from 1956-2012.
- *More precipitation:* Total annual precipitation increased steeply by 25.8% from 1956 through 2012, while summer precipitation remained relatively unchanged.
- *Heavier precipitation:* From the 1961-1990 period to the 1991-2010 period, the amount of precipitation falling during the heaviest 1% of precipitation events increased by 22.2%.

Of particular concern is the increase in heavy precipitation. A "very heavy" precipitation day, as defined by the National Climate Assessment, is in the top 1% of daily precipitation totals. These precipitation events are typically disruptive and can cause infrastructure damage. Cleveland has seen a 16.3% increase in heavy precipitation events. The cumulative change in the precipitation falling during these events was 22.2%. Another key finding is that the freeze-free season (growing season) lengthened by 20 days from 1956-2012. The average date of first freeze is arriving 9.4 days later and the average date of last freeze is arriving 10.6 days earlier.

Mortality Rates (Appendix F) Extreme weather threatens human life. Dr. Scott Sheridan (KSU) looked at mortality rates in the Cleveland/Cuyahoga County for the overall population and for demographic subsets of the population based on gender, age, and race. Overall mortality increases in the event of high heat days, with the most immediately observable impacts in cardiovascular-related mortality and those 75 and older, regardless of sex or race. Within these categories, there is a sharper increase in black mortality than white, and slightly higher for men than women. Looking at a 14-day period, in which the impacts are assessed in aggregate, a generally similar pattern is observed, although results are broader and more intense. The relative risk is greatest for cardiovascular and respiratory mortality. A greater risk is observed for blacks than whites, while across age and sex differences are minimal.

In cold weather, more mixed results emerge. Typically the most negative impacts are not immediately observed, but rather are observed several days to two weeks later, most notably with increases in respiratory diseases. For 14-day cumulative results, increases in mortality are observed in overall mortality. Blacks and whites, and males and females, are equally affected. Cardiovascular and respiratory mortality are greater than deaths from other causes. Those 75 and older are more affected than younger people.

Urban Heat Island and Land Cover Analysis (Appendix G) Dr. Pravin Bhiwapurkar (KSU) analyzed urban heat island effects and land cover in the four target neighborhoods of Slavic Village, Kinsman, Glenville, and Detroit Shoreway. Strategies to adapt for a changing urban climate are summarized at the following scales:

House and parcel-scale recommendations:

1. Use light colored shingles or paint roofs white to increase roof albedo values.
2. Increase insulation, especially in attics, and improve air tightness of buildings.
3. Promote natural ventilation during warm weather using operable windows.
4. Replace existing windows with energy-efficient windows.

5. Plant shade trees, shrubs, and vines on the west and southwest sides of the house; solar friendly deciduous trees to shade the east; an open understory to allow penetration of cool breezes; and evergreens to the northwest and west for protection from winter winds.
6. Shade air conditioners or place them on the north side of a building where feasible.
7. Reduce impervious surfaces.
8. Promote onsite green infrastructure strategies such as rain gardens, bioswales, water-smart gardening, and urban agriculture.

Neighborhood-scale recommendations:

1. Remove unneeded impervious surfaces, such as abandoned parking lots.
2. Maintain/expand existing tree canopy by providing funding and training for residents
3. Propose greening strategies for vacant land, like stormwater retention or urban farming, in locations where market demand for traditional real estate development is limited.

Urban-scale recommendations

1. Consolidate vacant parcels for urban forests and other green space uses, since larger green spaces offer a greater range of benefits than small, scattered-site greening efforts.
2. Concentrate greening efforts in neighborhoods where existing tree canopy is minimal; and in headwaters areas to capture stormwater runoff and improve water quality.
3. A variety of urban greening approaches should be considered. For example, large industrial properties provide opportunities for green roofs. Parking lots are suitable for green infrastructure. Transportation networks allow for increased street tree density and canopy cover. A diverse range of greening efforts improve the health of urban ecosystems and offer economic and social benefits.

Additional Research The team identified at least three additional studies that would be helpful for local climate change planning efforts. We plan to engage the university network formed through this initiative (Kent State University, University at Buffalo, University of Michigan) to pursue external funding for research that is targeted to local needs.

1. *Parcel-Level Vulnerability:* It may be possible to combine data from state and county sources, along with a survey of city residents, to map parcel-level vulnerability to climate impacts. The results would be helpful for targeting programs and outreach efforts, supporting first responders during extreme weather events, and coordinating demolition of abandoned houses. We are currently developing a proposal to the National Oceanic and Atmospheric Administration, and will also explore funding from Homeland Security, Health and Human Services, and the National Institutes of Health.
2. *Neighborhood Weather Stations:* While data gathered at the three airport weather stations begins to show how the urban heat island effect may impact Cleveland as a whole, additional weather stations in each of Cleveland's neighborhoods would provide temperature and precipitation data that could be analyzed against land cover maps to determine relationships among variables like land use, population density, and distance to Lake Erie. Potential funding sources include local foundations, the National Science Foundation, Health and Human Services, the National Oceanic and Atmospheric Administration, and the Environmental Protection Agency.
3. *Temperature in Weatherized Homes:* Investigating thermal environmental conditions in homes pre- and post-weatherization will help determine how insulation affects interior temperature and moisture levels, and reduces associated illnesses like hypertension and asthma. Potential funding sources include local foundations, University Hospitals, the Cleveland Clinic, Health and Human Services, and the National Institutes of Health.

3. CLIMATE CHANGE in CLEVELAND and the GREAT LAKES

Based on peer-reviewed scientific literature, climate projections, and assessments conducted for the U.S. Global Change Research Program (compiled in Appendix C), Cleveland can expect physical changes in temperature, precipitation, and extreme weather events, including:

- *Increased Temperatures:* From 1956 to 2012, the average annual temperature in Cleveland increased by 2.4°F. By 2070, the average annual temperature may warm by an additional 4°F. These higher temperatures will increase the number of heat-related deaths, reduce water quality in Lake Erie, strain food systems, degrade air quality, and put pressure on native plants and animals.
- *Changes in Precipitation:* From 1956 to 2012, the average annual precipitation in Cleveland increased by 25.8%. During the fall, the increase was greater at 57.4%. Heavy rain and lake effect snow are expected to increase. This may cause flooding, combined sewer overflows, a reduction in river and stream quality, and higher maintenance costs.
- *Extreme Weather Events:* Weather-related threats in Northeastern Ohio include severe storms, flooding, lake effect snow, tornadoes, temperature extremes, and erosion/landslides. A warming climate and decreasing ice cover on Lake Erie may cause an increase in the frequency and intensity of these extreme weather events, threatening human life and causing significant property damage.

These conditions may affect local sectors and systems, including:

- *Public Health:* Increased heat wave frequency and intensity, increased humidity, degraded air quality, reduced water quality, and change in vector borne disease patterns will increase public health risks.
- *Water Quality:* Climate change will exacerbate a range of risks to Lake Erie, including harmful algal blooms, an increased number of combined sewer overflows, and declining beach health.
- *Food Systems:* In the next few decades, longer growing seasons and rising carbon dioxide levels will increase yields of some crops, though those benefits will be progressively offset by extreme weather events. In the long term, climate change is expected to decrease agricultural productivity.
- *Forests and Land Cover:* The composition of forests is changing as the climate warms. Many tree species are shifting northward, with more southerly varieties replacing them. Many iconic tree species (e.g., Sugar Maple, Buckeye) will slowly be replaced by other species in the next century.
- *Energy:* Cleveland has an energy-intensive economy with per capita greenhouse gas emissions higher than the national average. The city has a lot of poor-quality housing, which increases household energy usage. Warmer temperatures will reduce building heating loads, but these gains may be offset by increased reliance on air-conditioning.
- *Transportation Systems:* Decline in ice cover will lengthen the commercial navigation season on Lake Erie. More freeze-thaw cycles, flooding, erosion, lake effect snow, and heat waves may cause significant damage to local transportation infrastructure.
- *Fish and Wildlife:* The effects of increased heat stress, flooding, drought, and late spring freezes on natural and developed ecosystems may be magnified by pest prevalence, increased competition from non-native or opportunistic native species, ecosystem disturbances, and land-use change.

4. DATA SOURCES

In an effort to identify specific areas of vulnerability in Cleveland, we mapped four physical factors and six social factors that research has shown to correlate closely with climate-related vulnerabilities. The four physical factors are:

1. Land coverage/impervious surface (Northeast Ohio Regional Sewer District; Cuyahoga County GreenPrint)
2. Land coverage/tree canopy (Cuyahoga County GreenPrint)
3. Buildings constructed before 1939 (Cuyahoga County Auditor's Office)
4. Flood zones (Federal Emergency Management Administration)

Areas with a high percentage of impervious surfaces and a sparse tree canopy are especially at risk during heat waves. Households in these areas may also experience higher energy bills on an on-going basis. Older housing is less likely to have air conditioning and less likely to be energy-efficient in both hot and cold weather.

Houses in flood zones are more likely to experience basement flooding and mold growth. However, the FEMA-designated flood zones within the city of Cleveland are not extensive because many creeks and streams were filled in or contained in culverts during the city's peak periods of development. Many parts of the city experience flooding problems, but this is not adequately reflected in the flood zone maps. Additional data needs on physical conditions include:

- Houses and streets in Cleveland most prone to flooding (determined by surveying residents city-wide or targeted to areas where the city receives frequent complaints)
- Insurance claim data at the parcel level (LexisNexis/Comprehensive Loss Underwriting Exchange database)
- Historical alignments of creeks and streams and locations of existing culverts (Cuyahoga County Planning Commission, historical maps and atlases)

The six social factors we chose to represent climate-related vulnerability are:

1. Residents without a high school diploma
2. Residents over age 65
3. Non-white residents
4. Households below poverty level
5. Living in rental property
6. Households without a vehicle

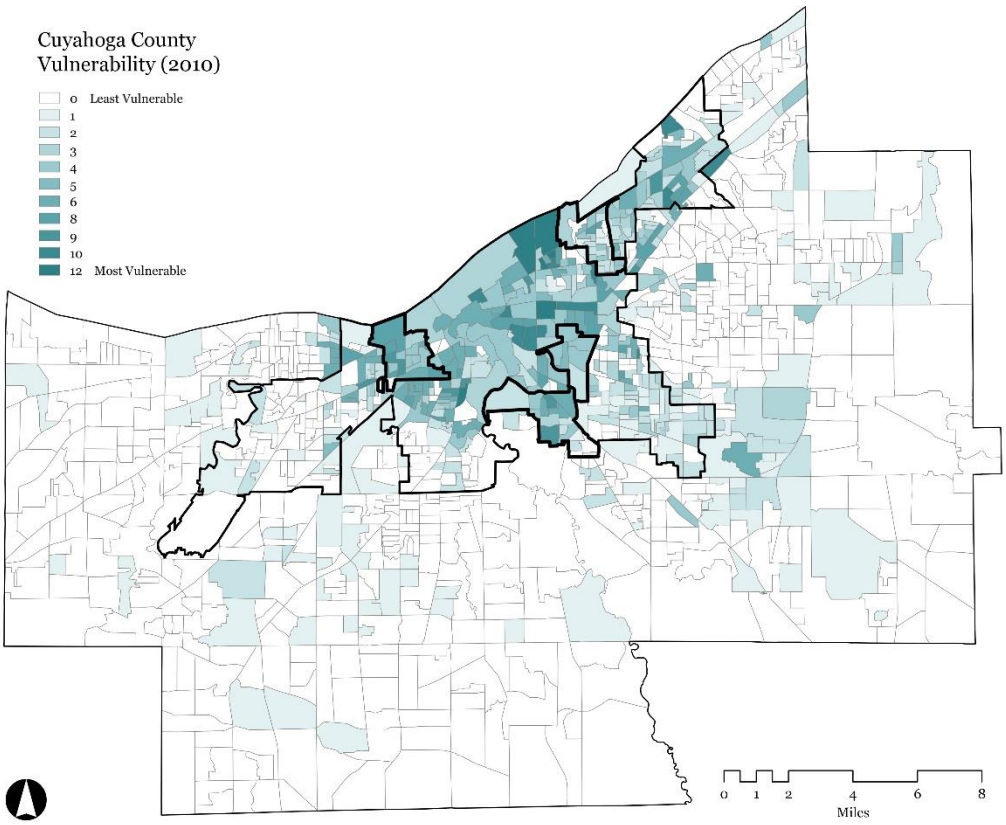
The 2010 US Census and Northeast Ohio Community and Neighborhood Data for Organizing (NEO CANDO) were the sources for social data. Additional factors that may affect social vulnerability in Cleveland include:

- Walkability/bikeability/transit connectivity of city neighborhoods as a measure of access (using Walk Score®, Bike Score®, and Transit Score® data)
- Average housing tenure as a measure of neighborhood stability (US Census)
- Percentage of people living alone, cross-referenced with residents over 65 (US Census)

5. CLIMATE VULNERABILITY + ASSETS

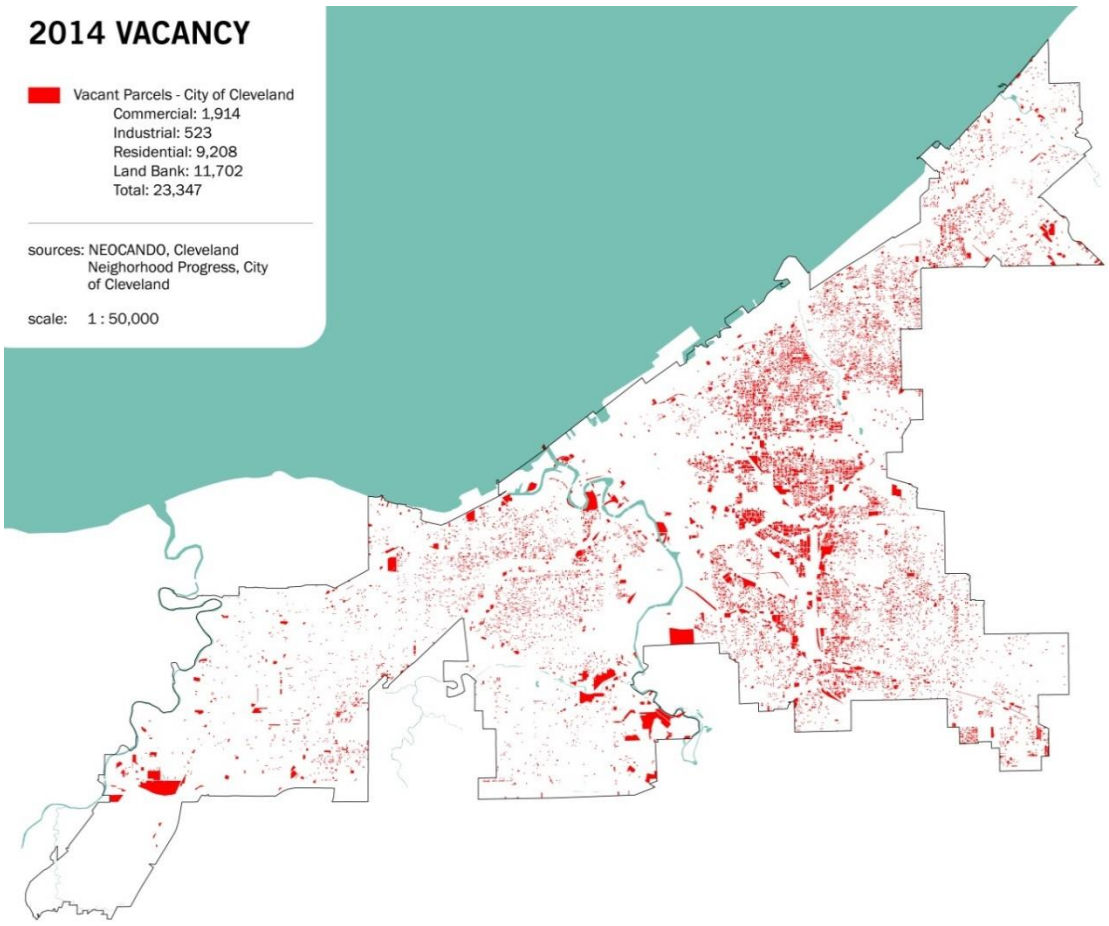
We investigated the geographical distribution of climate-related vulnerability to understand what strategies might be appropriate to increase resilience in each of the four neighborhoods. For example, mapping socio-economic variables that are known to increase vulnerability (e.g. income, housing age), against demographic variables (e.g. race, age), and physical variables (e.g. vegetation, flood zone), may provide a better understanding of what adaptation and resilience strategies to employ in each neighborhood. For instance, if socio-economic vulnerability is clustered in an area with low amounts of vegetation and high amounts of asphalt, an appropriate strategy might be to start a street tree-planting program to create jobs and shade pavement that contributes to the urban heat island effect. If these areas also have low levels of car ownership, solutions might point to increasing public transportation and opening cooling centers during extreme heat events. These combined social and physical approaches to building resilience in the City of Cleveland can complement other efforts by planners and emergency managers at the county- and city-level.

The matrix and maps (Appendix E) display correlations among six social variables and four physical variables that are known to increase vulnerability to climate change. These variables were adopted after a review of the vulnerability and environmental health science literature. They are also directly related to the expected impacts of climate change for Cleveland (Appendix D) and the temperature-related mortality analysis (Appendix F). Although we continue to refine the maps, preliminary results indicate that the four neighborhoods we are working with are more vulnerable to the effects of climate change when compared to the other neighborhoods of Cleveland and the suburbs of Cuyahoga County. However, each neighborhood has different factors that contribute to the vulnerability; we plan to use additional statistical analyses to unpack these data.



Although Cleveland neighborhoods have a higher degree of vulnerability than surrounding suburban jurisdictions, the city also has important assets, including:

- A robust network of community development corporations.
- A dedicated team of neighborhood climate ambassadors to lead community outreach and engagement efforts.
- Established partnerships with the city, the county, the regional sewer district, faith-based institutions, and other non-profit organizations in advancing neighborhood scale climate adaptation strategies.
- Weatherization programs–Cleveland has one of the earliest and most effective home weatherization programs in the country. Environmental Health Watch, a Cleveland-based non-profit, launched a Healthy Homes initiative in 1980, which is a model for similar programs across the country. Cleveland is also re-starting the Cleveland Energy $aver program which helps residents save upwards of 30% on energy bills.
- A large inventory of vacant land (much of which is held in city and county land banks) that can be used to help buffer residents from the adverse impacts of climate change and foster more sustainable and resilient development in the future.



This plan is designed to leverage the city's assets, target resources to the neighborhoods most likely to be affected by the adverse impacts of climate change, and build on recent planning efforts in the city, as described in the next section. The next step in our mapping efforts will be to identify these assets geographically, and look for opportunities to incorporate them into city- and county-level planning efforts.

6. LOCAL EFFORTS to ADDRESS CLIMATE CHANGE

The *Cleveland Climate Resilience and Urban Opportunity Plan* was developed in close collaboration with the Mayor's Office of Sustainability to build on the *Cleveland Climate Action Plan* (CAP). The CAP, completed in September 2013, serves as primary implementation framework for the Sustainable Cleveland 2019 initiative (Appendix I). Since 2009, Mayor Frank G. Jackson has hosted the initiative with the vision to build a thriving green city on a blue lake by 2019, the 50th anniversary of the infamous Cuyahoga River fire. Each year leading up to 2019 represents a different "Celebration Year" for the following topics: Energy Efficiency, Local Foods, Advanced & Renewable Energy, Zero Waste, Clean Water, Sustainable Mobility, Green Space, Vital Neighborhoods, and Thriving People. The CAP integrates all Celebration Year topics, while expanding upon Sustainable Cleveland's existing structure for community engagement.

The Mayor's Office of Sustainability convened a 50-member Climate Action Advisory Committee with representatives of leading Cleveland organizations from the commercial, industrial, educational, government, and non-profit sectors to inform and create the CAP. The Committee prioritized 33 actions to reduce greenhouse gas (GHG) emissions 80% below a 2010 baseline by 2050. The CAP includes interim goals of 16% by 2020 and 40% by 2030. The actions are split into six focus areas:

1. Energy Efficiency and Green Building
2. Advanced and Renewable Energy
3. Sustainable Mobility
4. Waste Reduction and Resource Conservation
5. Land Use and Clean Water
6. Community Engagement and Public Health

PRIORITIES While reducing GHG emissions is a driving force for many of the city's climate change efforts, the CAP includes 13 actions that build resilience to the impacts of climate change. Examples where implementation has already begun include:

- *Action 1:* Support programs and policies to retrofit residential buildings.
- *Action 8:* Increase distributed energy installations.
- *Action 20:* Make biking and walking easier and safer.
- *Action 27:* Develop and implement an urban tree plan to grow the canopy.
- *Action 29:* Implement green infrastructure to capture stormwater on-site.
- *Action 32:* Recognize capacity of neighborhoods and community groups to implement climate mitigation and adaptation initiatives.
- *Action 33:* Conduct climate change vulnerability assessment and integrate projected impacts into existing plans.

With funding from the World Wildlife Fund and the George Gund Foundation, the city and the advisory committee developed the *Neighborhood Climate Action Toolkit*, in partnership with community development corporations in the Kinsman, Glenville, and Detroit Shoreway neighborhoods. The toolkit is an asset-based approach that helps residents advance neighborhood priorities while also furthering Cleveland's climate action goals.

The toolkit is used to identify neighborhood-based projects and support their implementation through the *Cleveland Climate Action Fund,* which the Mayor's Office of Sustainability created with funding from Partners for Places, The Cleveland Foundation, and the George Gund

Foundation. In the last five months, climate action workshops were held in six neighborhoods. Thirteen neighborhood-led projects have been awarded grants over two grant rounds in 2015.

POLICIES and PROGRAMS The implementation framework provided by the CAP, the 50-member advisory committee, the toolkit, and the Climate Action Fund contribute substantively to the city's climate change efforts and help to ensure that policies and programs reflect the priorities of a diversity of residents. Areas of opportunity include:

1. Update of the Cleveland CAP in 2017 that reflects lessons learned from this initiative.
2. Integration of adaptation into the City Emergency Operations Plan and the Cuyahoga County All Hazards Mitigation Plan.
3. Establishment of policies related to land access and land banks.
4. Continued implementation of Cleveland's residential energy efficiency programs, including the Home Weatherization Assistance Program and Cleveland Energy $aver.

The Office of Sustainability plans to develop a more comprehensive protocol for integrating equity into sustainability planning and engaging citizenry in decision-making and self-determination. This protocol development is supported by ongoing participation in the Urban Sustainability Director's Network programs on integrating equity into urban sustainability.

NEIGHBORHOOD CLIMATE ACTION TOOLKIT PROTOCOL

Step	Tools
1. Learn about climate change & Cleveland Climate Action Plan	• Climate 101 and 102 Presentation • Climate Action Videos
2. Identify neighborhood assets and concerns; relate them to climate action	• Climate Action Visual Collages • Neighborhood Climate Action Case Studies • "I am Sustainable Cleveland" Poster Campaign • Neighborhood Carbon Footprint Calculator
3. Develop a Neighborhood Climate Action Project Idea	• Workshop Facilitator's Guide • Sustainable Cleveland website • Neighborhood Carbon Reduction Calculator
4. Implement a Neighborhood Climate Action Project	• Cleveland Climate Action Fund (www.clevelandclimateaction.org)

CLIMATE IMPACTS OF RECENT PLANNING RECOMMENDATIONS In addition to the CAP and Neighborhood Climate Action Toolkit, Cleveland has three recent plans that will also help neighborhoods adapt to climate change.

1. *Cleveland Tree Plan: Planting with Purpose* (Appendix M) builds on a recent urban tree canopy assessment and two grants the city recently received for targeted tree planting in five neighborhoods. The tree plan, to be completed in 2015, will articulate a unified vision for Cleveland's urban forest and provide a roadmap for achieving this vision.
2. *Re-imagining a More Sustainable Cleveland* (Appendix J) establishes a framework for vacant land reuse to stabilize and beautify city neighborhoods through targeted greening efforts, while also identifying areas for future redevelopment.
3. *Cleveland Complete & Green Streets Policy and Typology Plan* (Appendix L) classifies streets into 14 different types, each with its own priorities for pedestrians, vehicles, transit, cyclists and green infrastructure.

A summary of climate change-related recommendations from these plans is located in Appendix H.

7. ADAPTATION ACTIONS and STRATEGIES

Cleveland's *Climate Resilience and Urban Opportunity Plan* is intended to achieve safer and more resilient neighborhoods that will help buffer all residents, especially low-income and elderly residents, from the adverse impacts of climate change.

An array of engagement strategies, projects, programs, policies, and research questions were generated through climate ambassador training sessions, community workshops, and neighborhood mini summits (pictured) held in April through June of 2015. A matrix of these ideas is located in Appendix B.

Based on a detailed assessment of the anticipated effects of climate change and Cleveland's specific, climate-related vulnerabilities, the top three community-generated priorities to be addressed through the plan include:

1. Protecting residents and neighborhoods from flooding, increased precipitation, and extreme weather events.
2. Reducing the risk of heat-related mortality.
3. Reducing household energy usage and costs.

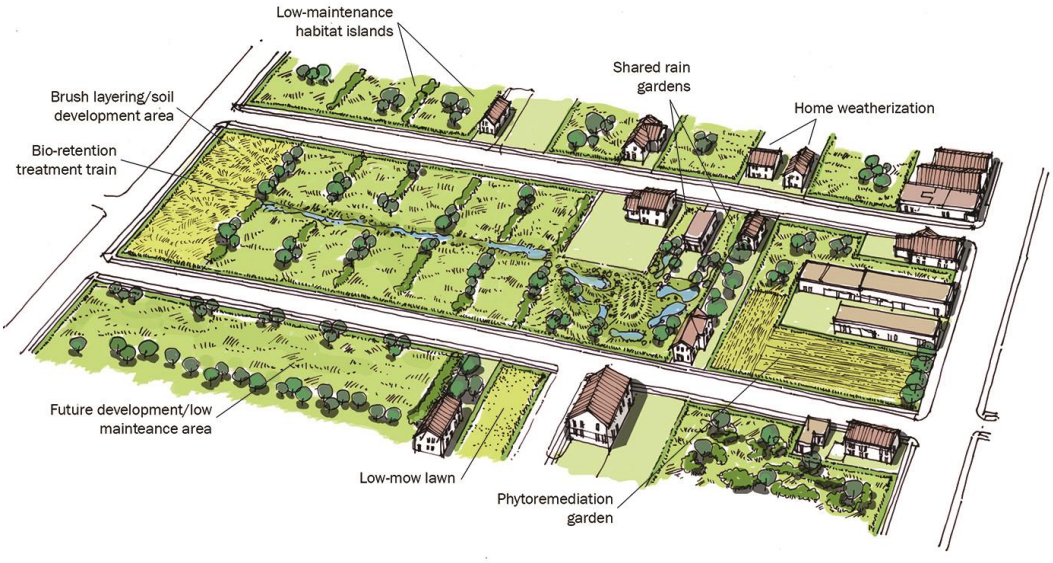
Addressing these three priority areas will help to achieve targeted and measurable improvements in climate resilience in Cleveland neighborhoods. Actions related to each of these three priority areas are described below. Almost every proposed action addresses all of the three priority areas in some way, but we listed each recommendations based on the primary outcome it is intended to address. At the end of this section, we included a series of actions that apply equally to all three priority areas.

FLOODING, INCREASED PRECIPITATION, AND EXTREME WEATHER

- *Climate Fairs:* Work with community development corporations and climate ambassadors to develop regular educational and community-building programs that emphasize accessible, hands-on education. Climate fairs would include face-to-face contact with climate action program coordinators, leadership development program intake, green job training intake, emergency response training stations and giveaways, and skill-building tutorials in urban agriculture and home weatherization. We will also focus on grassroots neighbor-to-neighbor outreach, finding trusted spaces for events, and providing free childcare, free transportation, and free lunch.
- *Green Party Crasher Program:* Bring outreach efforts to places where people already gather. Climate ambassadors would attend neighborhood celebrations and events to share information about climate change and community resilience in a fun and accessible way. This would bring the content of the Climate Fairs to new audiences.
- *Local Climate Documentaries:* Provide technical assistance, a camera crew, and film editing support to enable ambassadors to conduct interviews with Cleveland residents and public officials that shed light on Cleveland-specific climate impacts and actions. The documentaries would feature residents speaking about why climate change matters,

to help make these concepts real and relevant for more Clevelanders. Documentaries will be broadcast on websites, via social media, and at events.

- *Vacant Land Care Skill Share and Co-Op Program (Slavic Village/Detroit-Shoreway)* Connect neighborhood volunteers with vacant land reuse projects through a co-op program. Participants would be trained on how to access vacant land, and construct and maintain various landscape treatments. They could then sign up for shifts to take care of vacant lots. The program will help activate and maintain shared green spaces that foster social cohesion, provide micro cooling effects, and manage stormwater.
- *Green Infrastructure Investments* Develop programmatic ties to the Northeast Ohio Regional Sewer District's green infrastructure grants initiative, which is currently oriented toward market-driven development. Determine whether the grant program can be expanded to incorporate neighborhood-scale climate resilience efforts.
- *Changing flood zones* Identify new/anticipated flood plain areas based on patterns of increased precipitation and develop a land use overlay and/or a land bank screening tool to discourage new construction in existing and expanded flood plain areas. A program could be created to install retrofits for houses that are prone to flooding.
- *Headwaters Reforestation* Concentrate neighborhood reforestation efforts on vacant parcels in the higher areas of Cleveland's watersheds (headwaters areas) to capture stormwater runoff and reduce flooding risks at low places in the watersheds.
- *Re-imagining a More Sustainable Cleveland* Establish a no-build zone over buried streams and culverts, to be created by designating land in the city/county land banks as 'non-buildable' if a buried waterway runs below the site. Neighborhood-scale greening efforts on vacant sites that align with buried waterways can become part of a comprehensive climate adaptation strategy.

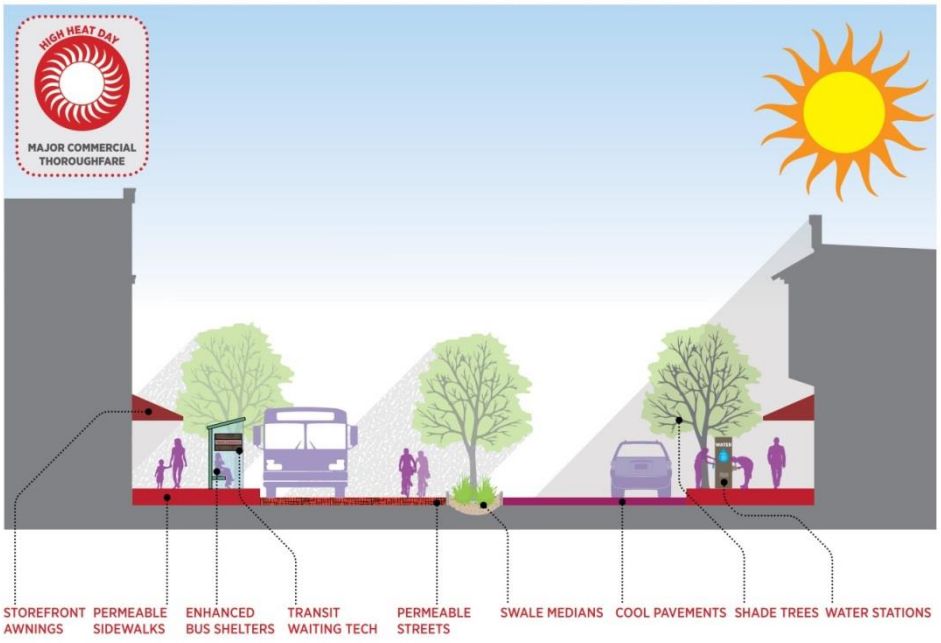


HEAT-RELATED MORTALITY

- *Climate Emergency Dramatizations:* Most people don't prepare for climate emergencies because they're not aware of potential dangers or they don't feel a sense of urgency about what could happen at some point in the future. In order to make climate emergencies seem more real and immediate, some of the climate ambassadors would like to imagine

future climate scenarios (i.e. blackouts, heat waves, food shortages) and act them out in short video productions. The ambassadors stressed that these videos should not be heavy-handed or frightening. People are more likely to absorb the information if it is presented in a straightforward yet humorous way. The videos would be shown at community screenings, movie nights, and in the schools to spark community dialogues.

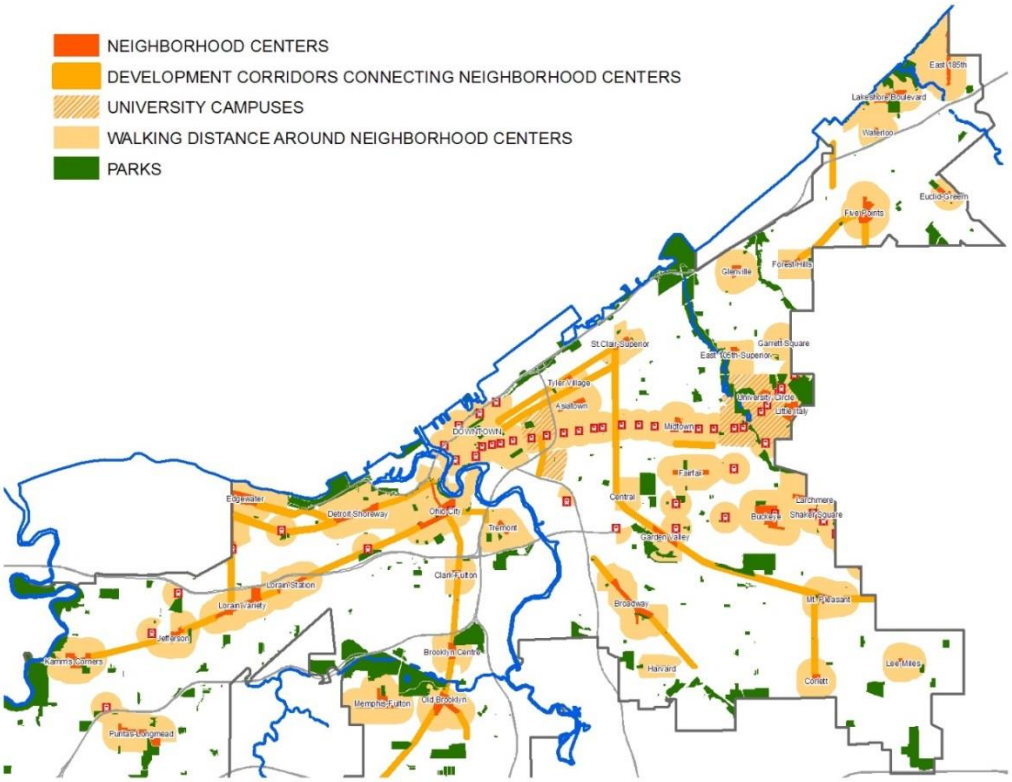
- *Intergenerational Landscaping Program (Glenville)* Adapt the existing Cleveland Youth Landscaping lawn care and snow shoveling program as a means to check on, monitor and connect seniors to support systems and resources to ensure their safety, health and well-being in the face of extreme weather. Through this program, young people will be trained and paid to provide lawn care and snow shoveling to low-income seniors.
- *City of Cleveland's Department of Aging's World Health Organization Age Friendly City Initiative* Collaborate on this existing initiative which is aimed at creating an inclusive and accessible environment for older adults with varying needs and capacities. This initiative will produce an Age Friendly Plan of Action. We will coordinate the climate resiliency aspects into the plan.
- *Mold Prevention* Provide public education about mold hazards, especially impacts on infants and children. Develop guidelines and educational materials about what to look for and where mold growth most frequently occurs. Provide tips for preventing mold growth before it starts, through waterproofing, ventilation and dehumidifiers; and for catching mold early, before it spreads. Provide information about who to call for help (City/County Health Departments).
- *Cooling Center Communication Network* Establish block-club-based mechanism to extend existing robo-call service to new neighbors and those who do not have landlines and therefore do not get notice of the cooling center locations and hours.
- *Complete and Green Streets:* Align implementation of the city's Complete & Green Streets ordinance and Typologies Plan (Appendix M) to help mitigate urban heat island effects and improve accessibility and thermal comfort for pedestrians, bicyclists, and transit riders in the city. Adopt climate resilient design guidelines (Appendix L) for new streetscape projects in the city.



REDUCED ENERGY USAGE AND COST

- *Home Weatherization* Focused expansion of home weatherization programs to low-income neighborhoods. Expand home weatherization efforts and investments in high-risk areas, as identified in the vulnerability mapping (Appendix E). Focus on insulation and air sealing, combined with operable windows, as a cost effective way to achieve comfortable interior temperatures in summer and reduce energy costs in winter. We will need to develop low cost security measures that will make residents more comfortable having operable windows.
- *Strategic Reforestation Efforts* to restore the urban tree canopy, especially in those neighborhoods most susceptible to urban heat island effects.
- *Coordination with Community Development Corporations on Neighborhood Plans* to achieve better land use choices that reduce energy demand, foster social cohesion, and make optimal use of the city's growing inventory of vacant land.
- *Climate-Ready Renters Training (Central-Kinsman)* Develop targeted programs and resources to help renters negotiate effectively with their landlords for home weatherization, energy efficiency upgrades, mold elimination, and other climate-related concerns. This initiative will also teach renters how to increase their comfort, protect their health, and prepare for climate challenges even if their landlord is unresponsive to their concerns. Empower Gas and Electric, the provider for the Cleveland Energy $aver program, will be piloting an energy efficiency program geared toward landlords which is a potential partnership for this action item.
- *Green Retrofit Model House (Any of the four neighborhoods where capacity exists)* Work with Environmental Health Watch and the Cleveland Housing Network to profile an acquisition and rehabilitation project as a showcase for cost effective sustainability strategies (e.g., water conservation, energy efficiency, etc.). Ideally, the model property would serve as a venue for hands-on workshops, seminars and educational sessions for community members.
- *Energy Saving Trees Program* In conjunction with the city's soon-to-be-completed tree plan, develop a tree planting strategy and online interface so residents can see the energy savings they could get with additional trees, to help increase public support for the restoration and maintenance of Cleveland's urban forest. The Arbor Day Foundation is a potential collaborator on this action item.
- *Transit-oriented development* Cleveland's more than 20,000 vacant lots create opportunities for urban greening and real estate development. Concentrating new development near existing transit may reduce overall household energy usage, provide mobility options in the event of energy shortages and power outages, and help foster social cohesion through walkable, transit-friendly neighborhoods.

SUSTAINABLE PATTERNS OF DEVELOPMENT
Cleveland City Planning Commission



ALL THREE PRIORITY AREAS

- *Funding Pool/Local Grant Program* to support neighborhood-generated projects and programs.
- *Applied Research Agenda* to help inform climate resilience efforts in Cleveland.
- *Professionals Initiative* (Citywide) Quarterly training for the community development corporation staff, city staff, and professional partners to share the latest information on anticipated climate change impacts, new programs and funding opportunities, and progress on implementation efforts from this work and Cleveland's Climate Action Plan.

COMMUNITY LEADERSHIP + ENGAGEMENT EFFORTS

In the implementation phase of this project, we will continue to work with four community development corporations (CDCs): Burten Bell Carr, Slavic Village Development Corporation, Famicos Foundation, and the Detroit-Shoreway Community Development Organization, along with a cohort of 20 neighborhood climate ambassadors. In partnership with Cleveland's CDC network, the ambassadors will serve three important roles:

- Community representatives on policy and advocacy matters – Examples include providing free registration to all 20 ambassadors to attend the City's Annual Sustainability Summit, as well as other events and trainings. Ambassador representatives will also join the Cleveland Climate Advisory Committee for the 2017 update of the CAP.

- Facilitators of workshops and presenters at community meetings on climate related topics – A main area of focus will be the dissemination of information related to program dollars for neighborhood-based climate strategies. Specifically, ambassadors would be trained to facilitate the Climate 101 workshops for the Cleveland Climate Action Fund that will integrate the implementation funds from this award. Along with CDC staff, the ambassadors will serve on the Selection Committee for prioritizing project awards. NOTE: There is a potential to offer Community Emergency Response Team (CERT) training as part of the ambassador training. CERT trains residents to respond to many climate-related emergencies such as flooding and high heat days.
- Cultivators of community engagement – Through their CDCs, the ambassadors will convene groups of neighbors, church groups, block clubs, students, and others to expand climate readiness and expand input into the prioritization of neighborhood-based climate mitigation, adaptation and social cohesion strategies.

This initiative will also take advantage of existing neighborhood leadership programs[1] and work towards introducing a Climate Awareness module into each program's curriculum.

ON-GOING RESEARCH

Recommendations for future research are described in the Overview section on page 4. Meetings with the climate ambassadors, residents, public officials, and the CAP advisory committee generated the following research questions—a list that we expect will grow as more Clevelanders become engaged in conversations about climate change.

- For stormwater infiltration on multiple vacant sites, how many sites, and in what configuration, are needed to achieve significant, measurable improvements in water quality?
- How do climate conditions vary between different Cleveland neighborhoods and what do we know about the microclimatology of each neighborhood? Installing weather stations in neighborhoods throughout Cleveland and Cuyahoga County would help with documenting variations in the urban heat island and enable more targeted strategies for heat emergencies and stormwater management over the long-term.
- What are the impacts of weatherization programs on actual houses in Cuyahoga County? Do these programs improve interior temperatures in real homes? How are the actual impacts and outcomes of weatherization efforts tied to existing programs like Home Weatherization Assistance Program?
- What are the current and anticipated economic impacts of climate change in terms of real dollars to real people?
- What are the potential health impacts of climate change actions (or inaction)? Can we link climate adaptation strategies to Cuyahoga County's new Community Health Improvement Plan (CHIP) or efforts by local hospitals to prepare for climate-related events like heat waves or heavy precipitation?
- Which programs and investments will have the greatest impact on the city's most vulnerable populations?
- How do pilot programs and projects scale up for neighborhood and city-wide impact? And which are most replicable in other cities?
- Which elements of the city's infrastructure networks are most vulnerable in the event of various climate emergencies?

[1] There are two in Cleveland: Neighborhood Leadership Development Program (NLDP) and the Neighborhood Leadership Institute (NLI). CNP and Kent State's CUDC are currently involved in both programs.

8. PROPOSED BUDGET

The proposed budget includes funding for on-going engagement and capacity-building efforts to implement neighborhood-scale climate resilience projects and programs.

YEAR ONE	
Community Engagement	
$10,000	Stipends for Climate Ambassadors (20 ambassadors X $500)
$10,000	Funding support for community development corporations (4 neighborhoods x $2,500)
$2,500	Climate fairs and other community engagement efforts
$10,000	Community-led public education efforts, educational videos and climate emergency simulation exercises
$7,500	Climate ambassador trainings
$2,500	Annual Stakeholder convening; annual plan assessment and update; printing
$42,500	*Subtotal*
Projects and Programs	
$123,500	Grant support for neighborhood-determined projects and programs (administered through Re-imagining Cleveland and the Cleveland Climate Action Fund)
$10,000	Pilot landscaping/snow removal initiative
$133,500	*Subtotal*
Administration and Technical Support	
$40,000	Administrative expenses: CNP @ $25K and Environmental Health Watch (EHW) @ $15K
$24,000	Technical assistance in developing program metrics, grant-writing, and "train the trainer" programs (UB, CUDC)
$20,000	Peer Learning expenses (travel, lodging, etc.)
$84,000	*Subtotal*
$260,000	**TOTAL**

During the first year, CNP and its partners will take full advantage of the results identified in the on-going research referenced on page 4 and 17. Based on what we learn, we will pursue matching support to grow the pool of funding available for the most efficacious community-generated projects and programs. We have already secured a $40,000 commitment for matching funds from the George Gund Foundation, allocated for grant support for neighborhood projects and programs. Community engagement efforts will both expand and refine the range of ideas, and establish priorities for implementation in years two and three.

Each funded project or program will have a schedule for implementation and clear metrics for evaluation. By the end of the first year, we will evaluate the first round of work and supporting engagement efforts. Based on this evaluation, we will prepare a detailed budget for year two and a preliminary budget for year three.

9. METRICS FOR EVALUATION AND KEY INDICATORS

A major component of Cleveland's *Climate Resilience and Urban Opportunity Plan* is a neighborhood grant program that will support projects and programs generated by residents for improving climate resilience. To ensure that grant-funded projects align with The Kresge Foundation and Island Press whitepaper entitled *Bounce Forward: Urban Resilience in the Era of Climate Change,* CNP, the university research team, the City of Cleveland, and the community development corporations will develop metrics to evaluate the adaptation strategies described in Section 7 to determine if they are:

- Lessening overall demand for energy;
- Helping Clevelanders anticipate and prepare for climate changes and shocks; and
- Fostering social cohesion.

CNP and the City of Cleveland have considerable experience in operating neighborhood-scale grant programs through the Re-imagining Cleveland vacant land initiative and the Cleveland Climate Action Fund.

We will establish a simple, but thorough process for grant submissions that includes community workshops and one-on-one technical assistance for community applicants. For each proposal, the university research team will assist grant applications in identifying clear, specific, and measurable outcomes based on the three priority areas (flooding, heat-related mortality, and reduced energy use) described in Section 7. For example, project metrics by category may include:

- Amount of reduction in impervious surfaces (flooding)
- Stormwater capture and infiltration (flooding)
- Amount of tree-canopy added (heat-related mortality)
- Number or percentage of elderly participants in an emergency preparedness program (heat-related mortality)
- Household energy usage before and after a proposed intervention (energy usage)
- Number or percentage of low income participants in a household energy audit program (energy usage)

We will pilot this process by evaluating the effectiveness of a sample of the 56 Re-imagining Cleveland vacant land reuse projects that have been implemented in Cleveland over the past five years. Although these projects were not intended as climate resilience strategies, they mirror many of the proposals put forward by residents during our community meetings.

For this pilot study, the projects will be placed into categories, including community gardens, orchards, rain gardens, parks and green spaces, bio-remediation areas, and side yard expansions. Depending on the project category, we will then develop measurement protocols to estimate physical changes such as impact on household energy use, stormwater infiltration, and air quality benefits. We will also try to estimate if the project has had a positive effect on community engagement and social cohesion by interviewing and/or surveying residents.

This pilot study will attempt to answer nine basic questions about the Re-imagining Cleveland vacant land reuse projects, consistent with the integrated framework for urban resilience:

1. Resilience of what? (What do we need? What do we value?)
2. Resilience to what? (Which natural hazards, environmental, or social changes?)
3. Resilience for whom? (Who is vulnerable? Who decides?)

4. Is the strategy diverse, redundant, and/or modular?
5. Does the strategy have tight feedbacks?
6. Does the strategy promote social capital, agency, equity, inclusiveness, and innovation?
7. Will the strategy help protect or restore systems in their current form?
8. Will the system be able to be modified to increase resilience?
9. How will the system transform over time to become more resilient?

Once we have completed this evaluation, we will then attempt to measure the resilience/social cohesion impacts of the ten Cleveland Climate Action Fund projects that were started in 2015. For these projects, we will work with the grantees to identify a range of metrics to assess physical change and social cohesion, such as local participation in events and programs, residents' opinions about the appearance of vacant land projects, and resident surveys to determine levels of neighborhood satisfaction and perceptions about safety. We will also ask the questions above of each project. We will use lessons learned from the Re-imagining work and the Cleveland Climate Action Fund projects to prioritize projects to go forward in each of the neighborhoods. Over the three-year lifespan of the project, we will continue to update these metrics, upload results to a database, and use the results to help tune the efficacy of the adaptation strategies. We will then share our results with other communities in the region to promote adaptation in cities facing similar challenges (e.g., Detroit, Toledo, Buffalo).

We will also attempt to measure the economic impacts of vacant land greening projects. Cleveland Neighborhood Progress has been awarded technical support from the Center for Community Progress to support this effort.

10. IMPLEMENTATION: PHASING + PRIORITIES

Priorities for implementation include:

- Expanding and amplifying community engagement efforts and develop new and innovative ways to bring more diverse participants into climate planning and adaptation initiatives. This includes expanding the climate ambassador program to include additional training, and possibly to offer a certificate program through the City of Cleveland to recognize efforts to increase climate resilience.
- Building on recommendations in existing plans, especially the Cleveland Climate Action Plan, the Climate Action Toolkit, the Cleveland Tree Plan, Re-imagining a More Sustainable Cleveland, and the Cleveland Complete & Green Streets Typologies plan. We have already started this process; an initial overlay that shows how each strategy intersects with a climate impact is included as Appendix H.
- Connecting with existing officials at the region-, county-, and city- level to coordinate climate change mitigation and adaptation efforts. These officials include staff from the County Board of Health, Emergency Management, City departments of Health and Aging, and local hospitals like University Hospitals and the Cleveland Clinic.
- Leveraging the city's growing inventory of surplus real estate, because it is a key resource for Cleveland and other older industrial cities in the Great Lakes region. The strategic reuse of vacant land can help mitigate the adverse impacts of climate change and convert the present liability of overgrown lots into a neighborhood asset that enhances property values and buffers residents against the adverse effects of climate change.
- Connecting with efforts ongoing in other Great Lakes Region cities through informal networking at climate change conferences but also through a new USDN Great Lakes Climate Adaptation Network that is co-chaired by Ann Arbor and Cleveland, and supported by the University of Michigan Climate Center. This network will help to help share lessons learned, avoid mistakes of other cities, and share successes from this project to help promote resilience at the regional level.

Cleveland has five existing mechanisms to fund these neighborhood-based projects, research, and outreach:

- Cleveland Climate Action Fund (Coalition of city, for-profit, and non-profit organizations)
- Re-imagining Cleveland (CNP)
- Green Infrastructure Grants (NEORSD)
- Research funding pursued by Kent State University, University at Buffalo, and the University of Michigan
- Neighborhood Connections grants, which foster social cohesion

We will use these funding mechanisms to support neighborhood-based projects, conduct research and evaluation of ongoing efforts, and distribute available resources to residents and community development corporations based on climate-related criteria.