

Project Title: Climate Safe Neighborhoods: A community collaboration for a more climate-resilient future

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Introduction to Climate Safe Neighborhoods

Climate Safe Neighborhoods is a national effort by Groundwork USA to identify neighborhoods that are more vulnerable to climate change, educate residents in these areas, and inspire climate action in these communities. Climate Safe Neighborhoods explores the relationship between historic redlining, racial-segregated housing and present-day climate impacts as well as utilizing community engagement to build more resilient communities. Groundwork Ohio River Valley (ORV) first brought the Climate Safe Neighborhoods (CSN) program to Cincinnati neighborhoods starting in 2020 by forming and planning Climate Advisory Groups (CAG) in partnership with Green Umbrella, Greater Cincinnati's Regional Climate Collaborative, and the City of Cincinnati Office of Environment & Sustainability. Following the success of the CSN program in Cincinnati, Groundwork ORV, Green Umbrella and Northern Kentucky University (NKU) received a US EPA Region 4 Environmental Education Grant to support environmental education projects that promote environmental awareness and stewardship and help provide people with the skills to take responsible actions to protect the environment.

Extending the CSN program into NKY was a multi-step process (Figure 1). First, data was compiled from federal, state, nonprofit, and local sources and analyzed by Geographic Information System (GIS) interns from the Northern Kentucky University's Environmental Science Program (ENV) with Groundwork's GIS Analyst to identify the most climate vulnerable neighborhoods in Covington, Newport, and Dayton, Kentucky. Next, the more intensive Climate Advisory Groups model was condensed into one-time CSN Community Workshops, co-facilitated by Groundwork ORV and Green Umbrella, where residents could give feedback on climate impacts they have seen in their communities and suggest solutions to reduce the climate vulnerability in their neighborhoods. The NKU ENV Science Communication class interpreted the Climate Safe Dashboard information and created community outreach materials including engaging, and accessible data derived from the Climate Safe Dashboard, organized into a Climate Communication Toolkit and marketing regarding upcoming CSN Community Workshops. The goal of the workshops was to empower communities by providing data and resources to assist them in obtaining funding and in organizing projects that will lead to more climate resilient neighborhoods. This case study is intended to share our experiences with this

collaboration and serve as a model for those others who may pursue similar climate resilience work with local communities.

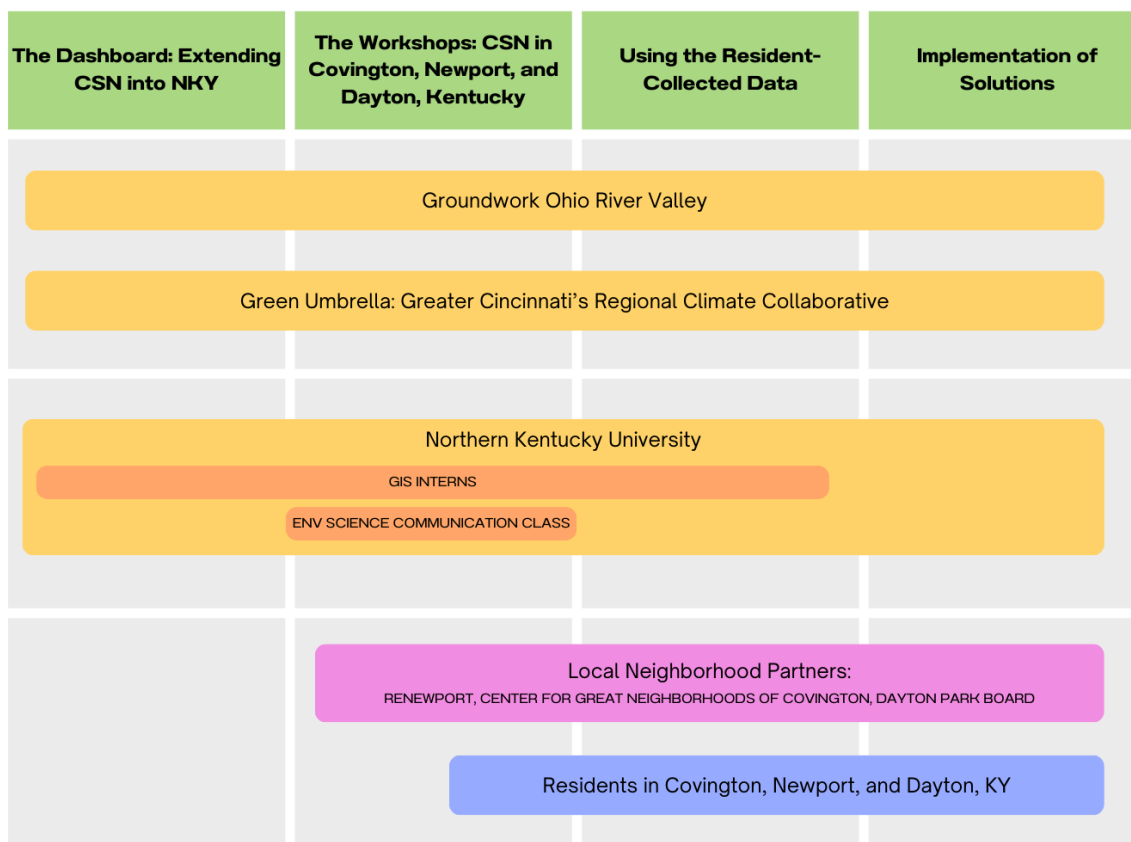


Figure 1. A timeline showing the different steps of the project (green) and the different partners that contributed at each step.

The Dashboard: Extending Climate Safe Neighborhood into Northern Kentucky

Creation of the Climate Safe Neighborhoods Dashboard allowed us to identify and compare neighborhoods vulnerable to climate change. The CSN Dashboard provides residents with easy access to data that shows how their communities have been impacted by the effects of historical redlining, segregation and climate change. Groundwork ORV created the dashboard using the softwares ArcGIS Pro, ArcGIS Online, and ArcGIS Experience Builder. The initial dashboard covered the area within the City of Cincinnati boundary and included layers relating to historical racism and demographic, health and environmental data.

The effort to extend the CSN program into Northern Kentucky included hiring three student interns from NKU to be trained and mentored in Geographic Information Systems (GIS) by Groundwork ORV. The students began with gathering GIS data in the form of map layers from federal, state, and local sources and accurately recording metadata for the layers in a

spreadsheet as well as on the ArcGIS Online items (Table 1). Metadata provides detailed information about the data itself such as the original creator, date of creation, or how the data was collected. Next, the layers were processed in ArcGIS Pro beginning with clipping to the Greater Cincinnati Area boundaries, which includes ten counties in Ohio, Kentucky, and Indiana. The layers were added to the CSN Dashboard for public viewing.

*Table 1. The layers utilized in the CSN Dashboard organized by type. * Indicates the layer was used in the Climate Vulnerability Model.*

Layer	Source
Environmental	
Ambient Air Temperature °F Afternoon*	CAPA/National Integrated Heat Health Information System
Brownfields	Environmental Protection Agency
Cincinnati Area Geographic Information System Heat Intervention	Cincinnati Area Geographic Information System
Cincinnati Area Geographic Information System Tree Canopy Percentage*	Cincinnati Area Geographic Information System
Climate and Economic Justice Screening Tool	Council on Environmental Quality
Combined Sewer Overflows	Ohio Environmental Protection Agency
Diesel Particulate Matter Environmental Justice Index*	Environmental Protection Agency EJScreen
Estimated Runoff Retention Value*	National Aeronautics and Space Administration DEVELOP
Greater Cincinnati Climate Vulnerability Layer	Groundwork Ohio River Valley
Hazardous Waste Proximity Environmental Justice Index*	Environmental Protection Agency EJScreen
Landslide Susceptibility*	National Aeronautics and Space Administration DEVELOP
Northern Kentucky Urban Tree Canopy Data*	OKI Regional Council of Governments
National Land Cover Database*	Multi-Resolution Land Characteristics
Ozone Environmental Justice Index*	Environmental Protection Agency EJScreen
Particulate Matter 2.5 Environmental Justice Index*	Environmental Protection Agency EJScreen
Toxic Industrial Activity Environmental Justice Index*	Environmental Protection Agency EJScreen
Traffic Proximity Environmental Justice Index*	Environmental Protection Agency EJScreen
Full Range Heat Anomalies	The Trust for Public Land
Demographic	
Low Income Low Access to Food	U.S. Department of Agriculture
Median Income	American Community Survey 5 Year 2018-2022

Percent People of Color*	Environmental Protection Agency EJScreen
Percentile Low Income*	Environmental Protection Agency EJScreen
Social Vulnerability Index	Centers for Disease Control and Prevention
Low-Income Energy Affordability Data (LEAD)	U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy
Health	
Toxic Releases to Air Environmental Justice Index*	Environmental Protection Agency EJScreen
Asthma Crude Prevalence*	Centers for Disease Control and Prevention
Cancer Crude Prevalence*	Centers for Disease Control and Prevention
Diabetes Crude Prevalence*	Centers for Disease Control and Prevention
High Blood Pressure Crude Prevalence*	Centers for Disease Control and Prevention
Life Expectancy*	National Center for Health Statistics
Obesity Crude Prevalence*	Centers for Disease Control and Prevention
Historical/Boundaries	
City of Cincinnati Home Owners Loan Corporation Redlining Map	Groundwork USA
City of Cincinnati Zoning 1925*	Groundwork Ohio River Valley
Historic Redlining Greater Cincinnati*	Mapping Inequality
City of Cincinnati Neighborhoods	Cincinnati Area Geographic Information System
Cincinnati, OH-KY-IN Core-Based Statistical Area	U.S. Census Bureau
City of Cincinnati Boundary	Cincinnati Area Geographic Information System
City of Covington Neighborhoods	LINK-GIS
City of Dayton Boundary	KyGovMaps
City of Newport Neighborhoods	LINK-GIS
City of Norwood Boundary	Ohio Department of Transportation: Transportation Information Mapping System
City of Norwood Wards	Norwood City Council

An important part of the dashboard extension into NKY was the creation of a climate vulnerability model, which was used to aid in determining neighborhoods that are in most need of climate resiliency. The climate vulnerability layer was derived using several environmental and socioeconomic layers such as tree canopy cover, runoff retention, and percent poverty to calculate areas that are most vulnerable to climate change using ArcGIS Pro ModelBuilder (Table 1). This was done by converting each layer from polygon to raster. We rescaled by function continuous rasters and reclassified categorical rasters on scales from 0-10, 10 being the most

vulnerable. Then all the resulting rasters were inputs for the Cell Statistics tool with the mean overlay statistic. This tool finds the average value for each cell by averaging all the input rasters, which are on a 0-10 scale. More information on building the model can be found in the resources section below. The vulnerability layer along with input from community partners were used to finalize the neighborhoods selected for holding the CSN Community Workshops.

The Community Workshops: CSN in Covington, Newport, and Dayton, Kentucky

We used the collected data and the climate vulnerability model to identify which neighborhoods in Northern Kentucky were most vulnerable to a changing climate and where to focus our efforts. The neighborhoods identified by the climate model and recommended by community partners were: Austinburg, Eastside, and Helentown in Covington, Two Rivers I, Two Rivers II, and Buena Vista in Newport, and Census Tracts 051101 and 051200 in the City of Dayton, KY. With the neighborhoods identified, we began planning the workshops to be held in these communities. For this project, we condensed the larger efforts previously done in Cincinnati by providing Community Climate Safe Workshop series, which were one-time workshops where residents could learn about what climate impacts their community is facing, what they can do to help counteract these impacts, and provide possible solutions that could be implemented within their communities. The goal of these workshops was to educate residents about the issues occurring within their neighborhoods, facilitate resident collaboration to create a plan on what can be done about these issues, and empower residents to advocate for change in their communities.

The planning of the workshops was a collaborative process that included students from NKU and neighborhood community partners (Table 2). Over the course of four months, a team of six undergraduate students completed research on each of the neighborhoods to learn how to successfully reach and engage residents to attend the CSN Community Workshops. This involved learning about the cultures and demographics of each of the seven neighborhoods. Research was done through the use of GIS data and learning from neighborhood organizations that live and work within these communities and have a depth of knowledge about the local residents.

Table 2: The community partners involved in the Northern Kentucky Climate Safe Neighborhood Community Workshops.

Community Partner	Community Partner Website
The Center for Great Neighborhoods of Covington	https://www.greatneighborhoods.org/
Keep Covington Beautiful	https://www.keepcovingtonbeautiful.com/

City of Covington Urban Forestry	https://www.covingtonky.gov/government/departments/public-works/urban-forestry
Westside Citizens Coalition	https://www.facebook.com/westsidecitizenscoalition/
ReNewport	https://renewportky.org/
City of Dayton Park Board	https://daytonky.com/boardscommittees/park-board/
Northern Kentucky Urban & Community Forestry Council	https://www.nkyurbanforestry.org/

After learning more about the expected audience that would be attending each of the workshops, the research team began to plan how to best inform and recruit local residents. The student team used best practices in science communication to create multiple flyers and social media posts to get the word out about the events. The flyers and posts were created in both English and Spanish, as research suggested high populations of Spanish speaking individuals within these communities. Two Spanish language majors at NKU translated the flyers and posters created by the research group. To identify ideal locations for advertising with flyers, the students walked around the selected neighborhoods searching for places such as city meeting spaces, coffee shops, and any other community hubs. While on this search, the research students also scouted for possible venue locations to hold the CSN Community Workshops. Students compiled a list of all potential advertising and workshop locations for each workshop and shared with Groundwork ORV and the neighborhood organizations. The neighborhood organizations then used all materials created by the student team to advertise for the workshops. This step is ideal, as the local organizations have the best connections with residents to increase advertising and workshop attendance success.

Neighborhood maps were an integral part of the individual workshops. Maps incorporating the environmental, demographic, and historic factors for each of these communities were created to educate residents at the CSN Lite meetings. Maps were designed to be clear and easy to understand, and used the same format and design process to further prevent any confusion for residents at the workshops. Factors that were chosen to present at the CSN Community Workshops included: tree canopy percent, average rainfall run-off retention, PM2.5 national percentile levels, respiratory hazard national percentile levels, heat anomalies, low income, and some health related layers such as: cancer, diabetes, and heart disease rates. A map of the climate vulnerability layer, an index of all environmental, demographic, and historic risk factors (i.e., the aforementioned model) was also presented to

residents. Maps were also translated into Spanish for neighborhoods with Spanish-speaking residents.

Next, the workshops were held in the respective cities. Each workshop began with a presentation introducing Groundwork ORV, the CSN program and partnership with Green Umbrella. A presentation of the map data followed with an explanation of how the climate vulnerability model was used to identify each focus neighborhood. Table 3 highlights the expected agenda of each event.

Table 3: The typical agenda followed at the CSN Community Workshops held in Covington, Newport and Dayton, Kentucky.

Organization	Time (minutes)	Activity
CSN Director, Groundwork ORV	30	Presentation of the national Climate Safe Neighborhoods effort, its goals and objectives, and an explanation of how the CSN goals apply to Northern Kentucky communities
GIS Analyst, Groundwork ORV	25	Presentation of information regarding redlining in the region and its subsequent climate impacts
NKU GIS Interns with Groundwork ORV	15	Mapping exercises with residents to identify climate vulnerability areas and specific issues
Green Umbrella	25	Brainstorm exercise for potential mitigation solutions and strategies in partner with community organizations influenced by data from dashboard
Community Partner	25	Overview of climate mitigation that has been completed within neighborhood and future projects that are currently in the works

The mapping activity was important for receiving feedback from residents on current climate impacts and potential solutions for the neighborhood. For each neighborhood, there were two large poster-sized maps, which showed only the streets, parks, and buildings. On one map, residents used stickers to identify places where they had seen climate impacts within their neighborhood (e.g., high temperatures, flooding), and on the other map residents placed stickers to identify areas where they would like to see climate solutions implemented. Residents were given 15 minutes to complete the activity with extra time allotted at the end of the workshop for residents to give any additional input. An online mapping activity was created using ArcGIS Survey123, designed to accommodate those who could not attend in person, and

allowed further data collection beyond the CSN Community Workshops. In future workshops, the time for the mapping activity may need to be extended. Throughout all workshops residents often took longer than 15 minutes to complete the exercise. At the workshops with higher attendance they often took even longer due to the fact that only so many people can fit around one map at a time. With more time to complete the mapping activity, all residents would get the chance to provide their suggestions without feeling rushed. This would help to collect more data, as well as ensure that all residents feel heard.

The workshops ended with a presentation from the partner organizations. Partner organizations highlighted the Regional Climate Collaborative, overviews of their organizations and programming, and informed the residents of past and future environmental projects that are going on within their neighborhoods.

Using the Resident-Collected Data

The CSN Community Workshops held in Covington, Newport, and Dayton, KY generated data directly from residents who lived within these communities. Much of the data collected came from the mapping activities held at each CSN Community Workshop with some additional data coming from the online mapping opportunity. To make the resident data more useful, the team first digitized the data by recreating the Impacts and Solutions maps using ArcGIS Pro and ArcGIS Online. Two new polygon layers were created for each neighborhood identifying the climate impacts and the suggested solutions from the residents. The layers were then added to the CSN Dashboard so they could be viewed publicly to foster more conversation and collaboration over climate issues and solutions. Maps with the new polygon layers were also exported to Adobe Illustrator with legends added to create maps that are easy for residents to understand and use for each neighborhood (Figure 2).

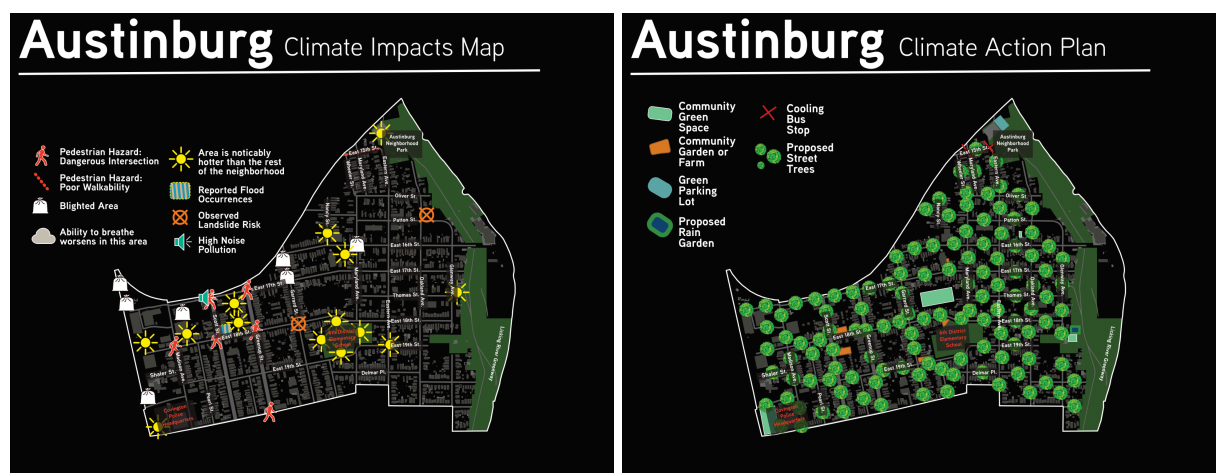


Figure 2. Two maps showing the locations of climate impacts (left) and proposed solutions to these impacts (right) that residents reported in the Austinburg neighborhood of Covington, KY.

Residents can continue to add climate impact and solution ideas through the go-vocal Thrive Together platform. The Thrive Together platform includes a team of regional stakeholders, organizations and agencies working to develop a Regional Climate Action Plan for the region's 16 counties. The platform offers an online channel for the public to engage and provide feedback that helps to better understand the values, hopes, concerns, and perspectives of Greater Cincinnati's communities. Last, we collected feedback from residents about their knowledge using pre- and post-workshop questionnaires to assess and improve future workshops. Residents stated that the workshops provided improved their understanding of how to locate environmental data for their community. They also showed more interest in being involved in hands-on implementation of solutions in their community when compared to before the workshop.

Implementation of Solutions

The data collected from the workshops held in Northern Kentucky has been used in various ways. In Newport, a neighborhood organization is using the data and maps when writing grant proposals. The funds will be used for multiple tree plantings in west Newport, with many more planned for the near future.

Tree plantings are just one of the many climate solutions that have come out of the Climate Safe Neighborhoods program. Other potential climate solutions include: community clean-up events, community gardens, and green infrastructure. In Cincinnati, many of these climate solutions have been implemented in the neighborhoods within the Climate Advisory Group model. For example, a green roof was installed on a high school after the suggestion was made by the Lower Price Hill Climate Advisory Group.

The workshops held in Northern Kentucky provided the focus neighborhoods with valuable information pertaining to what climate solutions residents want and need. This has inspired neighborhood community organizations to begin planning and implementing many of the suggested solutions. In Newport, they have already begun to hold tree planting events. In Dayton, small tree planting events are planned to take place over the next few months. In Covington, tree planting events are also planned. Another success is that the City of Covington will be supporting a full Climate Advisory Group, similar to the ones in Cincinnati. This group, composed of residents, will conduct a more in depth analysis of the climate impacts affecting Covington, and will receive more assistance from Groundwork ORV when implementing the solutions.

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Resources

Green Umbrella:

<https://greenumbrella.org/>

Green Umbrella ThriveTogether: A Sustainability Playbook for Greater Cincinnati:

<https://greenumbrella.govocal.com/en/pages/about-the-playbook>

Groundwork Ohio River Valley CSN Dashboard:

<https://storymaps.arcgis.com/collections/8c2fa0feff13424ca8738fe051b579db?item=7>

Groundwork Ohio River Valley CSN Dashboard Metadata:

https://docs.google.com/spreadsheets/d/1BoKCZU5nrvRx7IJVYgUyuiN1PEkpMqaJD0g_K21gCk8/edit?usp=sharing

Groundwork Ohio River Valley CSN Program:

<https://www.groundworkorv.org/programs/climate-safe-neighborhoods/>

Using ModelBuilder for the Climate Vulnerability Layer:

<https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-analyst/how-cell-statistics-works.html>

Partner Info

[Center for Great Neighborhoods of Covington](#)

[City of Covington](#), [Department of Public Works](#), [Forestry](#)

[City of Covington](#), [Neighborhood Services](#), [Solid Waste & Recycling](#)

[Dayton Park Board](#)

[Northern Kentucky Urban & Community Forestry Council](#)

[ReNewport](#)