NOACA
Northeast Ohio Areawide Coordinating Agency

Cleveland-Elyria Metropolitan Statistical Area Priority Climate Action Plan

March 1, 2024

PREPARED FOR:

Climate Pollution Reduction Grant Program
U.S. Environmental Protection Agency

PREPARED BY:

Northeast Ohio Areawide Coordinating Agency
1299 Superior Avenue, Cleveland OH 44114
Tel: (216) 241-2414

City of Cleveland
Office of Sustainability and Climate Justice
75 Erieview Plaza, Suite 115, Cleveland OH 44114
Tel: (216) 664-2455

This project has been funded wholly or in part by the United States Environmental Protection Agency (EPA) under assistance agreement 00E03472 to the Northeast Ohio Areawide Coordinating Agency. The contents of this document do not necessarily reflect the views and policies of the EPA, nor does the EPA endorse trade names or recommend the use of commercial products mentioned in this document.

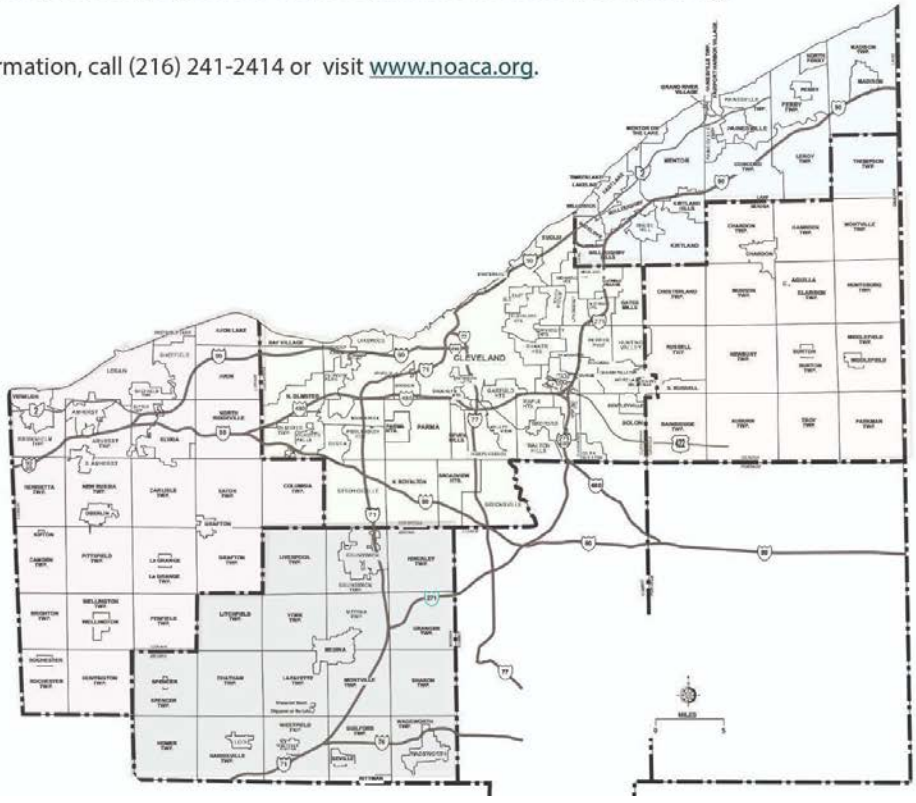
NOACA
Northeast Ohio Areawide Coordinating Agency

The Northeast Ohio Areawide Coordinating Agency (NOACA) is a public organization serving the counties of and municipalities and townships within Cuyahoga, Geauga, Lake, Lorain and Medina (covering an area with 2.1 million people). NOACA is the agency designated or recognized to perform the following functions:

- Serve as the Metropolitan Planning Organization (MPO), with responsibility for comprehensive, cooperative and continuous planning for highways, public transit, and bikeways, as defined in the current transportation law.
- Perform continuous water quality, transportation-related air quality and other environmental planning functions.
- Administer the area clearinghouse function, which includes providing local government with the opportunity to review a wide variety of local or state applications for federal funds.
- Conduct transportation and environmental planning and related demographic, economic and land use research.
- Serve as an information center for transportation and environmental and related planning.
- As directed by the Board, provide transportation and environmental planning assistance to the 172 units of local, general purpose government.

NOACA's Board of Directors is composed of 48 local public officials. The Board convenes quarterly to provide a forum for members to present, discuss and develop solutions to local and areawide issues and make recommendations regarding implementation strategies. As the area clearinghouse for the region, the Board makes comments and recommendations on applications for state and federal grants, with the purpose of enhancing the region's social, physical, environmental and land use/transportation fabric. NOACA invites you to take part in its planning process. Feel free to participate, to ask questions and to learn more about areawide planning.

For more information, call (216) 241-2414 or visit www.noaca.org.



2024 NOACA Board of Directors

Board Officers

President
Jeff Brandon
Trustee Chair, Montville Township

First Vice President
Chris Ronayne
Cuyahoga County Executive

Second Vice President
Justin Bibb
Mayor, City of Cleveland

Secretary
Timothy C. Lennon
Geauga County Commissioner

Treasurer
Jeff Riddell
Lorain County Commissioner

Immediate Past President
John R. Hamercheck
Lake County Commissioner

Assistant Secretary
Annette M. Blackwell
Mayor, City of Maple Heights

Assistant Secretary
Blaine Griffin
Cleveland City Council, Ward 6

Assistant Secretary
James W. Dvorak
Geauga County Commissioner

Assistant Secretary
Aaron Harrison
Medina County Commissioner

Assistant Treasurer
Michael Dylan Brennan
Mayor, City of University Heights

Assistant Treasurer
Andy Conrad, P.E., P.S.
County Engineer, Medina

Assistant Treasurer
Mark Cunningham
Columbia Township Trustee

Assistant Treasurer
James W. Dvorak
Geauga County Commissioner

Board Members

Cuyahoga County

Samuel J. Alai
Mayor, City of Broadview Heights

Larry Antoskiewicz
Mayor, City of North Royalton

Annette M. Blackwell
Mayor, City of Maple Heights

Pamela Bobst
Mayor, City of Rocky River

Michael Dylan Brennan
Mayor, City of University Heights

Matthew Castelli
Mayor, City of Middleburg Heights

Mary Cierebiej
Executive Director, Cuyahoga County Planning Commission

Timothy J. DeGeeter
Mayor, City of Parma

Michael Dever
Director of Public Works Cuyahoga County

Kirsten Holzheimer Gail
Mayor, City of Euclid

Meghan George
Mayor, City of Lakewood

Dale Miller
County Council Member

Chris Ronayne
County Executive

Kahlil Seren
Mayor, City of Cleveland Heights

Kim Thomas
Mayor, City of Richmond Heights

City of Cleveland

Justin Bibb
Mayor, City of Cleveland

James DeRosa
Director, Office of Capital Projects

Joyce Pan Huang
Director, City Planning Commission

Blaine A. Griffin
Ward 6, Council President

Stephanie Howse-Jones
Ward 7, Council Member

Brian Kazy
Ward 16, Council Member

Kerry McCormack
Ward 3, Council Member

Calley Mersmann
Sr. Strategist for Transportation & Mobility

Geauga County

Timothy C. Lennon
County Commissioner

James W. Dvorak
County Commissioner

Ralph Spidalieri
County Commissioner

Lake County

Ben Capelle
CEO, Laketran

James R. Gills, P.E., P.S.
County Engineer

John R. Hamercheck
County Commissioner

John Plecnik
County Commissioner

Richard Regovich
County Commissioner

Lorain County

Jack Bradley
Mayor, City of Lorain

Kevin Brubaker
Mayor City of Elyria

Kenneth Carney, Sr., P.E., P.S.
County Engineer

Mark Cunningham
Trustee, Columbia Township

David J. Moore
County Commissioner

Jeff Riddell
County Commissioner

Medina County

Jeff Brandon
Trustee Chair, Montville Township

Andy Conrad, P.E., P.S.
County Engineer

Aaron M. Harrison
County Commissioner

Patrick Patton
City Engineer

Regional and State

William D. Friedman
President and CEO, Cleveland-Cuyahoga County Port Authority

Rev. Charles Lucas
Board President, Greater Cleveland Regional Transit Authority

John Picuri, P.E.
Deputy Director, District 12, Ohio Department of Transportation

Kyle Dreyfuss-Wells,
Chief Executive Officer, Northeast Ohio Regional Sewer District

Ex Officio Members

Ferzan M. Ahmed, P.E.
Executive Director, Ohio Turnpike and Infrastructure Commission

David Emerman
District Chief, Ohio EPA, Northeast District Office

NOACA Directors

Grace Gallucci
Executive Director & CEO

Gina Beim
Deputy Director, Integrated Project, Program and Plan Advancement for Environmental Planning

Ronnie Blackshear
Deputy Director of Policy and Compliance

Lindy Burt
Director of Administrative Services

Joseph MacDonald, Ph.D
Director of Strategic & Environmental Planning

Ali Makarachi, Ph.D
Director of Transportation Planning & Engineering

Ed May
Director of Programming

Danielle Render
Director of Public Affairs

Deborah Wordell
Director of Finance

Acknowledgements

PCAP Development Team

NOACA

Grace Gallucci
Executive Director and Chief Executive Officer

Joe MacDonald
CPRG Program Manager and Director of Strategic and Environmental Planning

Danielle Render
Director of Public Affairs

Stefany Belasic
Digital Marketing Specialist

Deb Wordell
Director of Finance

Lindy Burt
Director of Administrative Services

Bev Burtzlaff
Associate Director of Government Affairs

~~Pamela~~ Davis
Senior Water Quality Planner

Ashleigh Dennis
Rideshare and Air Quality Planner

Kirk Kallenborn
Air Quality and Climate Policy Planner

Derek Taylor
Manager of Transportation Modeling

City off Cleveland

Justin Bibb
Mayor

Sarah O'Keefe
Director of Sustainability and Climate Justice

Tim Kovach
Decarbonization Strategist (former NOACA Air Quality Planner)

Anna Zaremba
Nature-Based Solutions Sustainability Manager

Emma Bullock
Decarbonization Intern

Katie Moore
Capital Projects Planner (former NOACA Manager of Environmental Planning)

Anand Natarajan
Assistant Director of Sustainability and Climate Justice

Tikora Alexander
Project and Grant Administrator

ICLEI USA

Angie Fyfe
Executive Director

Eli Yewdall
Senior Program Officer

Angelica Greco
Program Officer

Joel Ratner Community Partners

Joel Ratner
Executive Director

NOACA Climate Action Plan Strategy Committee Members ((a) committee member alternate; (*) NOACA Board of Directors member)

Roland Anglin
Dean and Professor, College of Urban Affairs, Cleveland State University
(a) Mark Henning
Research Associate, Energy Policy Center, Cleveland State University

Craig Arnold
Chair and Chief Executive Officer, Eaton Corporation
(a) Jennifer Dixon
Senior Manager, Executive Communications, Eaton Corporation

Bahhur Khalid
Commissioner of Airports, Cleveland Hopkins International Airport

Marcia Ballinger
President, Lorain County Community College
(a) Jonathan Volpe
Vice-President of Administrative Services and Treasurer, Lorain County Community College

Michael Baston
President, Cuyahoga Community College
(a) David November
Sustainability Manager and Facilities Administration Management Information System (FAMIS) Manager, Cuyahoga Community College

Morris Beverage, Jr.
President, Lakeland Community College
(a.) Michael Mayher
Executive Vice-President for Administrative Services and Treasurer, Lakeland Community College

* Justin Bibb
Mayor, City of Cleveland
(a.) Sarah O'Keefe
Director of Sustainability and Climate Justice, City of Cleveland

* India Birdsong
Executive Director, Greater Cleveland Regional Transit Authority
(a.) Maribeth Feke
Director of Planning, Greater Cleveland Regional Transit Authority

Robert Blue
Chair, President and Chief Executive Officer, Dominion Energy
(a.) Kyle Miller
Legislative Affairs Advisor, Dominion Energy

SeMia Bray
Co-Founder and Co-Facilitator, Black Environmental Leaders (Co-Chair)

Bethia Burke
Executive Director, Fund for Our Economic Future

* Ben Capelle
Executive Director, Laketran (Co-Chair)

Steven Corso
Chapter President, Ohio Ecological Food and Farm Association

Pat Covey
Chair, President and Chief Executive Officer, Davey Resource Group
(a.) Daniel Herms
Vice-President of Research and Development, Davey Resource Group

Trish Demeter
Interim President, Ohio Environmental Council
(a.) Brian Siggers
Cleveland Metro Advocacy Director

Amanda Denes-Diedrick
County Director, Ohio Farm Bureau
(a.) Jordan Hoewischer
Director of Water Quality and Research, Ohio Farm Bureau

* Kyle Dreyfuss-Wells
Executive Director, Northeast Ohio Regional Sewer District
(a.) Marie Fechik-Kirk
Manager of Sustainability and Special Projects, Northeast Ohio Regional Sewer District

* James Dvorak
Commissioner, Geauga County Board of Commissioners

James Foote
President and Chief Executive Officer, CSX Freight

Kim Foreman
Executive Director, Environmental Health Watch

James Foote
President and Chief Executive Officer, CSX Freight

Kim Foreman
Executive Director, Environmental Health Watch

William Friedman
President and Chief Executive Officer, Cleveland-Cuyahoga County Port Authority
(a.) Linda Sternheimer
Vice-President of Urban Planning and Engagement, Cleveland-Cuyahoga County Port Authority

Stephen Gardner
President and Chief Executive Officer, Amtrak
(a.) Kara Oldhouser
Director of Sustainability, Amtrak

Hannah Halbert
Executive Director, Policy Matters Ohio

* John Hamercheck
Commissioner, Lake County Board of Commissioners

* Aaron Harrison
Commissioner, Medina County Board of Commissioners
(a.) Denise Testa
Director of Planning Services, Medina County

Michael Hawthorne
President and Chief Executive Officer, Bendix

Rob Hillard
City Manager, City of Oberlin
(a). Linda Arbogast
Sustainability Coordinator, City of Oberlin

Brian Housh
Policy Manager, Rails to Trails Conservancy (Midwest Regional Office)

Eric Kaler
President, Case Western Reserve University
(a.) Stephanie Corbett
Director of Sustainability

NOACA Climate Action Plan Strategy Committee Members ((a) committee member alternate; (*) NOACA Board of Directors member)

Bill Koehler
Chief Executive Officer, Team NEO
(a.) Bryce Sylvester
Senior Director of Site Strategies, Team NEO

Ed Largent
President, Chief Executive Officer and Board Chair, Westfield Insurance
(a.) Jani Groza
Corporate Responsibility and Diversity Officer, Westfield Insurance

Rebecca Leibert
President and Chief Executive Officer, Lubrizol Corporation
(a.) Beth Grove
Chief Sustainability Officer, Lubrizol Corporation

Cliff Megerian
Chief Executive Officer, University Hospitals

Tom Mihaljevic
Chief Executive Officer and President, Cleveland Clinic Foundation
(a). John Utech
Senior Director of Sustainability and Environmental, Social, Governance (ESG) Strategy

* Dale Miller
Councilman, Cuyahoga County Council

Vince Parisi
President and Chief Executive Officer, Columbia Gas of Ohio
(a.) Ellen Macke
Director of Government and Public Affairs, Columbia Gas of Ohio

Lisa Petit
Acting Superintendent, Cuyahoga Valley National Park

* John Picuri
Director, Ohio Department of Transportation District 12
(a.) Keri Welch
Planning Engineer, Ohio Department of Transportation District 12

Kristy Ramey
Interim Executive Director, Clean Fuels Ohio

Ronn Richard
Executive Director, Cleveland Foundation
(a.) Stephen Love
Program Director of Environmental Initiatives, Cleveland Foundation

Tony Richardson
Executive Director, Gund Foundation
(a.) John Mitterholzer
Program Director of Climate and Environmental Justice

* Jeff Riddell
Commissioner, Lorain County Board of Commissioners
(a.) Andrew Lipian
Economic Development Coordinator, Community Development, Lorain County

* Chris Ronayne
Executive, Cuyahoga County
(a.) Mike Foley
Director of Sustainability, Cuyahoga County

Jim Squires
Chair, President and Chief Executive Officer, Norfolk Southern

Carmen Stemen
Planning and Environmental Specialist, Federal Highway Administration

Steven Strah
President and Chief Executive Officer, First Energy (CEI and Ohio Edison)
(a.) Patrick Kelly
Director of Economic Development, First Energy (CEI and Ohio Edison)

Jocelyn Travis
Cleveland Office, Audubon Society

* Bob Weaver
Director, Ohio Department of Transportation District 3
(a.) Corey Czinger
Environmental Specialist, Ohio Department of Transportation District 3

Sonia Winner
President and Chief Executive Officer, Cleveland Museum of Natural History
(a.) Gavin Svenson
Chief Science Officer, Cleveland Museum of Natural History

James Ziemnik
Director, Lorain County Metroparks

Brian Zimmerman
Executive Director, Cleveland Metroparks
(a.) Jennifer Grieser
Director of Natural Resources, Cleveland Metroparks

Greg Zucca
Executive Director of Community Transformation, MetroHealth
(a.) Tim Weber
Director of Sustainability, MetroHealth

NOACA Climate Action Plan Technical Working Group Members (T), Greenhouse Gas Inventory Working Group Members (G), Climate Risk and Vulnerability Assessment Working Group Members (C), and Technical Workstream Members (W)

Linda Arbogast
City of Oberlin
(T) (G) (C) (W)

Rishabh Bahel
Nestle (W)

Khalid Bahhur
Cleveland Hopkins International Airport (T)

Patty Bartee
Lubrizol (T)
Russ Bates, NXTGEN Clean Energy Solutions (W)

Russ Bates
NXTGEN Clean Energy Solutions (W)

Elizabeth Biggins-Ramer
Cuyahoga Solid Waste Management District (W)

Andy Boateng
Davey Resource Group
(T) (G) (C) (W)

Jack Bradley
City of Lorain (Mayor)
(W)

SeMia Bray
Black Environmental Leaders (T) (C)

Bethia Burke
Fund for Our Economic Future (T)

Bianca Butts
Burton, Bell, Carr Community Development Corporation (W)

Ben Capelle
Laketran (T) (W)
Cindy Cicigoi, Cleveland 2030 District (W)

Cindy Cicigoi
Cleveland 2030 District
(W)

Mary Cierebiej
Cuyahoga County Planning Commission (W)

Cynthia Connolly
City Club of Cleveland
(W)

Stephanie Corbett
Case Western Reserve University (T) (W)

Steven Corso
Ohio Ecological Food and Farm Association

Ben Cutler
Columbia Gas of Ohio (T)

Corey Czinger
Ohio Department of Transportation District 12 (T) (G) (W)

Dan Donaldson
Lake County Soil and Water Conservation District (W)

James Dvorak
Geauga County Board of Commissioners (T)

Jessica Fenos
Cuyahoga Solid Waste Management District (W)

Maíra Furtado Faria
Kent State University's Cleveland Urban Design Collaborative (W)

Marie Fechik-Kirk
Northeast Ohio Regional Sewer District (T) (G) (W)

Mike Foley
Cuyahoga County
(T) (C) (W)

James Foote
CSX (T)

Kim Foreman
Environmental Health Watch (T)

Lee Geiss
BlueGreen Alliance (W)

Grant Goodrich
Case Western Reserve University Great Lakes Energy Institute (W)

Jennifer Grieser
Cleveland Metroparks
(T) (W)

Beth Grove
Lubrizol (T)

Jani Groza
Westfield Insurance (T)

Hannah Halbert
Policy Matters Ohio (T)

Kevin Harrison
Northeast Ohio Regional Sewer District (G)

John Hamercheck
Lake County Board of Commissioners (T) (W)

Mike Hawthorne
Bendix (T)

Mark Henning
Cleveland State University (T)

Jordan Hoewischer
Ohio Farm Bureau (T)

Stephen Holcomb
Ni Source (G)

Brian Housh
Rails to Trails Conservancy (Midwest Regional Office) (T)

Edwin Hubbard, Jr.
NAACP Cleveland Branch
(W)

Lyn Ickes
Lorain County Board of Commissioners (T) (W)

Kelly Jasko
Eaton Corporation (T)

Alex Johnson
Cuyahoga Community College (T)

Brandon Jones
Clean Fuels Ohio (T)

Valerie Katz
Cuyahoga County
(T) (G) (W)

Patrick Kelly
First Energy (CEI and Ohio Edison) (T)

Michelle King
City of Cleveland
(T) (G) (C)

Courtney Kishbaugh
Greater Cleveland Partnership (W)

Ben Kroeck
Dominion Ohio Gas
(T) (G) (W)

Victor Leandry
El Centro (W)

Elizabeth Lehman
City of Cleveland
(T) (G) (W)

Stephen Love
Cleveland Foundation
(T) (C)

Ellen Macke
Columbia Gas of Ohio (T)

Leo Mahoney
Lorain County Community College (T)

NOACA Climate Action Plan Technical Working Group Members (T), Greenhouse Gas Inventory Working Group Members (G), Climate Risk and Vulnerability Assessment Working Group Members (C), and Technical Workstream Members (W)

Sara Byrnes Maier
Cleveland Metroparks (T)

Samira Malone
Cleveland Tree Coalition (W)

Pete McDonald
Western Reserve Land Conservancy (W)

Jenita McGowan
Eaton Corporation (W)
Cliff Megerian, University Hospitals (T)

Dion Mensah
Ohio Environmental Council (T)

Mandy Metcalf
Greater Cleveland Regional Transit Authority (T) (W)

Dale Miller
Cuyahoga County Council (T) (G) (C) (W)

Kyle Miller
Dominion Ohio Gas (T) (G) (W)

John Mitterholzer
Gund Foundation (T) (C) (W)

Matthew Moss
City of Cleveland (T) (G) (C) (W)

Anand Natarajan
City of Cleveland (W)

Sarah O'Keeffe
MetroHealth, then City of Cleveland (T) (W)

Kara Oldhouser
Amtrak (T)

Sharon Pearson
United Way of Greater Lorain County (W)

Michael Peters
Sway Mobility (W)

Lisa Petit
Cuyahoga Valley National Park (T)

Paul Pira
Geauga Park District (W)

Tristan Rader
Solar United Neighbors, City of Lakewood (W)

Nick Rajkovich
University of Buffalo (W)

Cyndi Rossi
Western Reserve Area Agency on Aging (W)

Nolan Rutschilling
Ohio Environmental Council (T)

Harvey Schabes
National Aeronautic and Space Administration (NASA) Glenn Research Center (W)

Matt Schmidt
Cuyahoga Metropolitan Housing Authority (W)

Ken Schneider
Cleveland Museum of Natural History (T) (C) (W)

Terry Schwarz
Kent State University's Cleveland Urban Design Collaborative (W)

Shelbie Seeberg
Cuyahoga County (T)

Brian Siggers
Ohio Environmental Council (T)

Jeffrey Sleasman
Clevelanders for Public Transit (W)

Shanelle Smith
KeyBank Corporation (W)

Abigail Spracklin
Clean Fuels Ohio (T)

Jim Squires
Norfolk Southern (T)

Katherine Starinsky
Cuyahoga County (W)

Chad Stephens
Sierra Club Ohio (T) (C)

Linda Sternheimer
Cleveland-Cuyahoga County Port Authority (T) (W)

Nicole Stika
World Kinect Energy (W)

Matt Sturgeon
Medina County Emergency Management Agency (W)

Gavin Svenson
Cleveland Museum of Natural History (T)

Rebecca Swab
Holden Forests and Gardens (W)

Bryce Sylvester
Team NEO (T) (W)

Brian Temming
Greater Cleveland Regional Transit Authority (T) (G) (W)

Denise Testa
Medina County Board of Commissioners (T)

Carol Thaler
Great Lakes Biomimicry (W)

Andy Thomas
Cleveland State University Energy Center (W)

Jocelyn Travis
Sierra Club Ohio (T)

John Utech
Cleveland Clinic Foundation (T)

Jacob VanSickle
Bike Cleveland (W)
Deepa Vedavyas, Cleveland Foundation (T) (C)

Deepa Vedavyas
Cleveland Foundation (T) (C)

Susan Walker-Meere
Lakeland Community College (T) (W)

Natoya Walker-Minor
Greater Cleveland Regional Transit Authority (W)

Bob Weaver
Ohio Department of Transportation District 3 (T)

Amanda Woodrum
Policy Matters Ohio (T) (G) (C)

Christina Yoka
Cleveland Division of Air Quality (W)

Yiran Zhang
Service Employees International Union Local 1 (W)

Bryan Zicherl
Ni Source (T) (G)

James Ziemnik
Lorain County Metroparks (T) (W)

Acronyms

ACEP (Agricultural Conservation Easement Program)

AFOLU (Agriculture, Forestry, and Other Land Uses)

ANL (Argonne National Laboratory)

ATSDR (Agency for Toxic Substances and Disease Registry)

BAU (Business as Usual)

BENEFIT (Buildings Energy Efficiency Frontiers & Innovation Technologies)

C2ES (Center for Climate and Energy Solutions)

C40 (a global network of mayors of the world's leading cities that are united in action to confront the climate crisis)

CAA (Clean Air Act)

CAAA (Clean Air Act Amendments)

CAFE (Corporate Average Fuel Economy)

CAP (Climate Action Plan)

CCAP (Comprehensive Climate Action Plan)

CCBH (Cuyahoga County Board of Health)

CDC (Centers for Disease Control and Prevention)

CDC (Community Development Corporation)

CEDS (Comprehensive Economic Development Strategy)

CEJST (Climate and Economic Justice Screening Tool)

CEQ (Council on Environmental Quality)

CH_4 (Methane)

CLE (Cleveland)

ClimRR (Climate Risk and Resilience Portal)

CMAQ (Congestion Mitigation and Air Quality)

CO_2 (Carbon Dioxide)

CO_2e (Carbon Dioxide Equivalent)

Community Protocol (United States Community Protocol for Accounting and Reporting Greenhouse Gas Emissions)

CPRG (Climate Pollution Reduction Grant)

CRVA (Climate Risk and Vulnerability Assessment)

CTC (Cleveland Tree Coalition)

CWA (Clean Water Act)

DCFC (Direct Current Fast Charging (electric vehicle charger))

DOE (United States Department of Energy)

EDD (Economic Development District)

EJ (Environmental Justice)

EJScreen (Environmental Justice Screening and Mapping Tool)

ENVISION (A sustainability framework and rating system was designed to help infrastructure stakeholders implement more sustainable, resilient, and equitable projects)

EV (Electric Vehicle)

FAMIS (Facilities Administration Management Information System)

FCEV (Fuel Cell Electric Vehicle)

FEMA (Federal Emergency Management Agency)

FLIGHT (Facility Level Information on GreenHouse Gases Tool)

GCoM (Global Covenant of Mayors)

GCRTA (Greater Cleveland Regional Transit Authority)

GHG (Greenhouse Gas)

GLISA (Great Lakes Integrated Science and Assessments)

GPC (Global Protocol for Community-Scale Greenhouse Gas Emission Inventories)

GWP (Global Warming Potential)

H2Ohio (A comprehensive water quality initiative that is working to strategically address serious water issues that have been building in Ohio for decades)

HFC (Hydrofluorocarbon)

HIA (Health Impact Assessment)

HOLC (Home Owners' Loan Corporation)

HUD (United States Department of Housing and Urban Development)

HVAC (Heating, Ventilation and Air Conditioning)

ICLEI USA (formerly International Council for Local Environmental Initiatives)

IPCC (Intergovernmental Panel on Climate Change)

IRA (Inflation Reduction Act)

IUC NA (International Urban Cooperation North America)

JRCP (Joel Ratner Community Partners)

kWh (kilowatt hours)

L2 (Level Two (electric vehicle charger))

LEARN (Land Emissions and Removals Navigator tool was developed to help communities in the United States estimate the local greenhouse gas (GHG) impacts of their forests and trees)

LIDAC (Low Income/Disadvantaged Community)

LUST (Leaking Underground Storage Tanks)

MAGNET (Manufacturing Advocacy and Growth Network)

MDHVs (Medium- and Heavy-Duty Vehicles)

MMBtu (one million British thermal units)

MOS (Mayor's Office of Sustainability)

MPO (Metropolitan Planning Organization)

MSA (Metropolitan Statistical Area)

$MTCO_2e$ (Metric Tons of Carbon Dioxide Equivalent)

N_2O (Nitrous Oxide)

NAACP (National Association for the Advancement of Colored People)

NAAQS (National Ambient Air Quality Standard)

NASA (National Aeronautic and Space Administration)

NCEI (National Centers for Environmental Information)

NEO (Northeast Ohio)

NEOLEB (Northeast Ohio Lake Erie Basin)

NEORSD (Northeast Ohio Regional Sewer District)

NEVI (National Electric Vehicle Infrastructure)

NF_3 (nitrogen trifluoride)

NLCD (National Land Cover Database)

NOACA (Northeast Ohio Areawide Coordinating Agency)

NOFO (Notice of Funding Opportunity)

NOP (National Organic Program)

NPL (National Priorities List)

NREL (National Renewable Energy Laboratory)

O_3 (Ozone)

Ohio EPA (Ohio Environmental Protection Agency)

OMJ (Ohio Means Jobs)

OWP (Overall Work Program)

ppb (parts per billion)

PCAP (Priority Climate Action Plan)

PFC (Perfluorochemicals)

$PM_{2.5}$ (Fine Particulate Matter)

RFP (Request for Proposals)

RMI (Rocky Mountain Institute)

RMP (Risk Management Plan)

RSEI (Risk-Screening Environmental Indicators)

SF_6 (sulphur hexafluoride)

SI (Supplemental Index)

SMART (Strengthening Mobility and Revolutionizing Transportation)

SNAP (Supplemental Nutrition Assistance Program)

SOV (Single Occupancy Vehicle)

STEM (Science, Technology, Engineering, and Mathematics)

SVI (Social Vulnerability Index)

TOD (Transit-Oriented Development)

TRI (Toxic Release Inventory)

$\mu g/m^3$ (micrograms per cubic meter)

USDA (United States Department of Agriculture)

US EPA (United States Environmental Protection Agency)

USGCRP (United States Global Change Research Program)

UST (Underground Storage Tanks)

VMT (Vehicle Miles Traveled)

WRI (World Resources Institute)

Table of Contents

List of Figures

List of Tables

Executive Summary

The region that birthed the modern-day environmental movement has another opportunity to serve as vanguard against a growing, global challenge. When the Cuyahoga River caught fire again in downtown Cleveland in 1969, the event fanned a smoldering movement into a roaring protest against the devastating impact of human pollution on the nation's waterways, air quality and natural ecosystems. The result was the United States Environmental Protection Agency (US EPA) and an unprecedented wave of federal regulation to counter polluters and protect our fragile environment. More than 50 years later, another daunting challenge to our global sustainability in the form of climate change has prompted the US EPA to take dramatic steps to spur regions, states, tribes, and territories across the nation to counter the climate challenge.

This Priority Climate Action Plan (PCAP) represents the first key outcome in a major climate planning initiative for the entire Cleveland-Elyria Metropolitan Statistical Area (MSA). It builds on previous and ongoing climate action plans at the municipal and county level. The regional greenhouse gas inventory highlights the significant contribution of electricity generation and transportation sources to climate change. Given the high contribution from these sources, the projected emissions reductions from the electricity, building efficiency, steel manufacturing and transportation priority measures exhibit relatively high impact toward emissions reduction. These are the greatest areas of opportunity to mitigate climate change in Northeast Ohio, while expansion of forests and restoration of tree canopy offer opportunity for carbon sequestration.

The Cleveland-Elyria MSA is an extremely diverse region and spans the full spectrum of legacy industrial, inner-ring suburban, contemporary exurban, and rural communities (including small villages and historical Western Reserve towns). The priority measures in this PCAP evolved from direct, multi-modal engagement with decision-making, technical and public stakeholders. The measures comprise a menu of potential actions to reduce GHG emissions that provide communities with options to best fit their respective needs.

The Cleveland-Elyria MSA has significant low-income and disadvantaged communities (LIDACs) in diverse locations. While many stakeholders recognize much of the City of Cleveland meets LIDAC criteria, many inner-ring Cleveland suburbs in Cuyahoga County are also LIDACs. Furthermore, there are LIDACs in legacy industrial towns with high minority populations well outside of Cleveland, such as Elyria, Lorain, and Painesville. There are also LIDACs in rural, eastern Geauga County, due to growing Amish concentrations. The diverse geography of LIDACs undergirds the need for regional climate action planning and spotlights a tremendous opportunity to build consensus to combat a shared challenge.

NOACA had already undertaken a regional greenhouse gas emissions inventory prior to the US EPA's initial CPRG Program announcement. NOACA and City of Cleveland staff worked with ICLEI USA to ensure that the regional inventory reflected the recommended sectors from USA EPA and feedback received from stakeholders during NOACA's extensive engagement effort. The diagram on the next page illustrates the relationship between these sectors, symbolized by key icons. A subsequent page outlines the priority measures developed for this PCAP, potential actions within those measures, and the icons that represent the emissions sectors most affected by each priority measure.

Greenhouse Gas Inventory Sectors

US EPA	ICLEI/NOACA	
Buildings, Electricity Generation	Residential Energy	
Buildings, Electricity Generation	Commercial Energy	
Industry, Electricity Generation	Industrial Energy	
Transportation	Transportation and Mobile Sources	
Waste and Materials Management	Solid Waste	
Waste and Material Management	Waste and Wastewater	
Waste and Material Management	Process and Fugitive Emissions	
Waste and Material Management	HFCs (Refrigerants)	
Agriculture/Natural and Working Lands	Agriculture	
Agriculture/Natural and Working Lands	Forests and Trees	

REGIONAL CLIMATE ACTION PRIORITIES

Cleveland-Elyria Metropolitan Statistical Area Priority Climate Action Plan

Clean Electricity

Sectors:

- Support current local municipal electric utilities development of clean energy
- Virtual power plant; community choice aggregation; grid responsive demand management; microgrid development; and electricity storage
- Decarbonize the grid
- Build regional consortium of researchers and manufacturers to pursue federal grants like the recent hydrogen hubs
- Partner with school districts to increase rooftop solar availability- coordinated procurement (bulk)
- Develop community and large scale solar projects on public buildings/property
- Solarize campaign where homeowners across community or region receive group solar purchase price from prescreened contractors
- Regional clean cities coalition that advocates for streamlining renewable projects, permitting, and stabilizing capacity markets

Building Efficiency and Electrification

Sectors:

- Financial incentives and novel financing approaches to promote more adoption of renewals and energy efficiency/conservation
- Incentivize energy conservation measures in public buildings and the use of ENVISION rating system to verify new or renovated public infrastructure
- Benchmarking policy that requires larger buildings to report energy use (possible energy tune-up requirements for low performing buildings).
- Increase home weatherization programs
- Electrify the heating sector through heat pumps, geo-thermal, networked geo-thermal and other means to reduce natural gas devices and emissions (renewable natural gas only when necessary); identify opportunities and develop pilots for district/ neighborhood scale geothermal heat networks
- Advocate for the state to update building code
- Install building envelope and electrification upgrade package (include electrical system upgrades) for low and moderate income residents (stack incentives for low/no cost).
- Workforce development/contractor training for energy efficiency and building electrification opportunities; educational clearinghouse/website for homeowners to easily identify efficiency incentives and contractors

Green Steel Production

Sectors:

- Expand participation in the US Department of Energy's better plants program (which identifies opportunities for industrial energy efficiency)
- Use of green hydrogen, electric arc furnaces, or new technologies using clean electricity
- Implement technologies to reduce emissions in the production process

Vehicle Miles Traveled Reduction

Sectors:

- Incentivize smart land use patterns that create transit oriented developments (TODs) around transit hubs, with integration between transit providers and first/last mile modes (bikeshare, scooters, electric car share)
- Include multimodal transportation infrastructure and Complete Streets
- Encourage smart land use to minimize commute distances (saving time, money and emissions)

Light Duty Vehicle Electrification

Sectors:

- Electrify region's municipal and local government fleets
- Educate residents and dealers about the benefits of electric vehicles and available Inflation Reduction Act tax incentives
- Create robust, reliable public electric vehicle charging network with an emphasis on areas with a high volume of multi-family housing

Heavy Duty Vehicle Electrification

Sectors:

- Electrify region's school buses, public transit vehicles and other heavy-duty vehicles & equipment

Refrigerants Capture

Sectors:

- Build a system and conduct education to ensure refrigerants are captured at the end of equipment life
- Work with heating, ventilation and air conditioning (HVAC) contractors and provide consumer collection/dropoff for appliances

Solid Waste Diversion

Sectors:

- Divert organic waste (food waste and paper) from the landfill through education, establishment of community drop-off locations for food waste composting, commercial pick-up locations and curbside organics collection

Nature-Based Solutions

Sectors:

- Protect and restore healthy, stable streams and water systems, including Lake Erie and river shorelines
- Actively address existing and new forest pests (e.g. Spotted Lanternfly) and pathogens (e.g. Beech Leaf Disease) aggressively and at an early stage to eradicate or at least minimize damage to forests and trees.
- Expand tree canopy, coordinate tree planting programs and disseminate knowledge (e.g. on suitable species) throughout the region
- Manage public and private landscapes to provide communities with accessible recreation and support habitat, biodiversity, and ecosystem services, including adoption of managed landscape ordinances
- Remove unutilized pavement and other impervious surfaces, decompact soil and restore natural surfaces to support stormwater absorption
- Support long-term protection and acquisition of large blocks of undeveloped land or parcels that strategically connect/link green spaces in the region
- Provide education, resources, and incentives to help communities, businesses, and homeowners build detention basins, rain gardens, permeable pavements, native landscaping, and other stormwater management tools.
- Expand green infrastructure grant programs throughout the region

Agriculture Actions

Sectors:

- Manure management actions to capture methane for energy
- Conservation agriculture (uses cover crop, crop rotation, and minimal tilling to produce annual crops; protects soil, avoids emissions, and sequesters carbon)

NOACA
Northeast Ohio Areawide Coordinating Agency

1 Introduction

1.1 CPRG Overview

The United States Environmental Protection Agency (US EPA) makes it clear in its Climate Pollution Reduction Grants (CPRG) Program Guidance that climate change is a serious issue for the United States and its population. Examples of extreme weather continue to increase in both severity and frequency across many areas, with significant consequences for quality of life, environmental health, economic productivity, and future generations. US EPA recognizes that, "if unchecked, future climate change is expected to further disrupt many areas of life and exacerbate existing challenges to prosperity posed by aging and deteriorating infrastructure, stressed ecosystems, and longstanding inequalities."[1] As with most challenges, there is opportunity to make the necessary investments to clean the nation's economy and catalyze innovation for more equitable, resilient and vibrant states and regions.

Section 60114 of the Inflation Reduction Act (IRA) appropriates $5 billion to US EPA for its CPRG efforts. This money will support states, territories, municipalities, tribes, and similar groups in their development and implementation of greenhouse gas (GHG) emission reduction plans. The total amount of appropriated funds goes toward the following:[2]

- Phase I planning grants ($250 million for eligible entities to develop GHG emissions reduction plans)
- Phase II implementation grants ($4.6075 billion for grants to GHG emissions reduction measures from funded plans)
- Administrative costs ($142.5 million)

The Northeast Ohio Areawide Coordinating Agency (NOACA) and the City of Cleveland partnered on a CPRG workplan and budget to help scale up established local climate action planning and pollution reduction efforts to the regional level. The City of Cleveland developed its first Climate Action Plan (CAP) in 2013 and updated it five years later.[3] Cuyahoga County developed its first such plan in 2018 and has also begun its update.[4] Smaller communities such as Oberlin[5] and Lakewood[6] have completed CAPs; others such as Cleveland Heights[7] are amid that process. Furthermore, organizations of regional influence, such as the City of Cleveland-Cuyahoga County Port Authority[8] and the Greater Cleveland Regional Transit Authority

[1] United States Environmental Protection Agency Office of Air and Radiation. March 1, 2023. Climate Pollution Reduction Grants Program: Formula Grants for Planning - Program Guidance for States, Municipalities, and Air Pollution Control Agencies (retrieved 1.31.2024 from https://www.epa.gov/inflation-reduction-act/about-cprg-planning-grant-information).

[2] (Ibid).

[3] The Cleveland Climate Action Plan (https://www.clevelandohio.gov/city-hall/office-mayor/sustainability/cleveland-climate-action-plan).

[4] The Cuyahoga County Climate Change Action Plan (https://www.countyplanning.us/projects/climate-action-plan/).

[5] Oberlin's Climate Action Plan (https://cityofoberlin.com/city-government/departments/sustainability/).

[6] Lakewood Climate Action Plan (https://www.lakewoodoh.gov/planning-development-projects-programs/).

[7] City of Cleveland Heights (https://www.clevelandheights.gov/civicalerts.aspx?aid=726).

[8] Port of Cleveland (https://www.portofcleveland.com/strategic-plan/).

(GCRTA),[9] have approved climate action plans. It is time for NOACA to scale up a regional effort.

1.2 PCAP Overview

The Cleveland-Elyria Metropolitan Statistical Area (MSA) Priority Climate Action Plan (PCAP) includes all the elements required by US EPA:

- GHG inventory
- GHG reduction (priority) measures
- Low Income/Disadvantaged Communities (LIDAC) benefits analysis
- Review of authority to implement for each measure

In addition to the required elements, the Cleveland-Elyria MSA PCAP will also touch on benefits, costs, intersection with other funding availability, and workforce implications for each of the priority measures. The Cleveland-Elyria MSA CPRG Program planning team will reserve its analysis and presentation of GHG emissions projections, GHG reduction targets, and in-depth quantitative analysis of priority measures (benefits, costs, intersection of funding, and workforce planning) for the Comprehensive Climate Action Plan (CCAP).

1.3 PCAP Scope

<u>NOACA</u>

NOACA launched its preliminary climate action planning work in fall 2021 and partnered with the Cleveland Foundation and the George Gund Foundation to establish its commitment to this work in spring 2022. NOACA held a Climate Action Summit on March 15, 2022, as a kick-off event with more than 200 stakeholders (see Figure 1). NOACA staff assembled both a climate action planning strategy committee and technical working group shortly thereafter.

Figure 1. NOACA Climate Action Summit Presentation

[9] Federal Transit Administration, GCRTA Climate Action Plan (https://www.transit.dot.gov/regulations-and-programs/environmental-programs/gcrta-climate-action-plan).

As part of this framework, NOACA utilized support from the Foundations to contract with ICLEI USA and initiate a Regional CAP in the mold of the Global Covenant of Mayors (GCoM) for Climate & Energy Initiative to expand regional climate action in the United States. The GCoM initiative evolved from the International Urban Cooperation North America (IUC NA) project.[10] As part of this process, the project supported efforts by four US 'regions' or 'metropolitan areas' to join the GCoM and respond to the reporting requirements. The four pilot regions were Chicago, IL; Kansas City, MO; Minneapolis, MN; and Washington, DC (also some additional work in Denver-Boulder, CO).[11] Although NOACA was too late to participate as a pilot, NOACA's Board Policy Committee did support a comprehensive approach for NOACA climate action planning that would inventory both mobile and stationary sources of GHG emissions and develop both mitigation (reduce emissions) and adaptation (build resilience to climate change) strategies.

According to the IUC NA project's Terms of Reference, there were four major required outputs:

1. GHG Emissions Inventory
2. Climate Risk and Vulnerability Assessment (CRVA)
3. Regional CAP - Adaptation/Resilience Strategies
4. Regional CAP - Mitigation/Emissions Reduction Strategies

NOACA committed to emulate this model and completed both a published GHG emissions inventory (2022) and a draft CRVA (2023) in partnership with ICLEI USA. NOACA had also initiated efforts to develop adaptation and mitigation strategies prior to US EPA's release of its Notice of Funding Opportunity (NOFO) and Guidance for the CPRG Program in spring 2023.

City of Cleveland

The City of Cleveland has maintained and updated a CAP for more than a decade. The Cleveland CAP outlines five focus areas and several cross-cutting priorities that identify objectives, goals, and specific actions necessary for a thriving and resilient City:[12]

- Energy Efficiency and Green Building
- Clean Energy
- Sustainable Transportation
- Clean Water and Vibrant Green Space
- More Local Food, Less Waste

In the past decade, the City has accomplished significant progress towards its sustainability goals.[13]

- Reduced carbon pollution has been reduced; improved water quality; and economic growth.
- Recognized for support of alternative energy sources (i.e., solar and wind).
- Installed over 70 miles of bike infrastructure and launched a bike share program.

[10] International Urban Cooperation Programme - European Union (EU) (https://iuc.eu/na/home/).

[11] GCoM USA – Regional and Metro-scale Climate Leaders Terms of Reference (https://iuc.eu/fileadmin/user_upload/Regions/iuc_na/user_upload/GCoM_USA_Regions_ToR.pdf).

[12] The Cleveland Climate Action Plan (retrieved 2.6.2024 from https://www.clevelandohio.gov/city-hall/office-mayor/sustainability/cleveland-climate-action-plan).

[13] Ibid.

- The Cleveland Climate Action Fund supported over 50 resident-led, neighborhood-based projects.
- Cleveland Tree Plan[14] implementation by dozens of organizations.

The Cleveland-Elyria MSA PCAP incorporates both the previous work of NOACA and the City of Cleveland, along with content from other local CAPs. A more comprehensive presentation of local context is available in a later section.

1.4 PCAP Development Approach

Previous CAPs or GHG inventories

NOACA's climate action planning program focuses on accelerated climate action and ambitious climate neutrality to protect its community members from the impacts of climate change. Through a collaboration of community partners and ICLEI USA, NOACA has embraced a holistic and integrated approach to move towards climate neutrality. NOACA's ambitious climate action planning is a pivotal opportunity for Northeast Ohio to experience a wide range of co-benefits outside of emissions reductions.

NOACA's bold climate action will provide co-benefits across many sectors, such as socio-economic opportunities, reduced poverty and inequality, and improved health and environmental quality (see Figure 2). Not only does NOACA intend to build a resilient community, but it also ensures a safe and secure space for future generations to thrive. This initiative is about much more than climate change. It is meant to strengthen the economy, clean the environment, and improve the health and wellness of Clevelanders, suburbanites, exurbanites, and those who live in rural communities and small villages. As the City of Cleveland has demonstrated through its leadership on climate action planning, "the work must be done in a way that ensures that those most in need enjoy the benefits of climate action."[15]

[14] Cleveland Tree Coalition (CTC). 2020. Cleveland Tree Plan 2020 Tree Canopy Progress Report (http://www.clevelandtrees.org/cleveland-tree-plan/cleveland-tree-plan-2020-tree-canopy-progress-report/).
[15] The Cleveland Climate Action Plan (retrieved 2.6.2024 from https://www.clevelandohio.gov/city-hall/office-mayor/sustainability/cleveland-climate-action-plan).

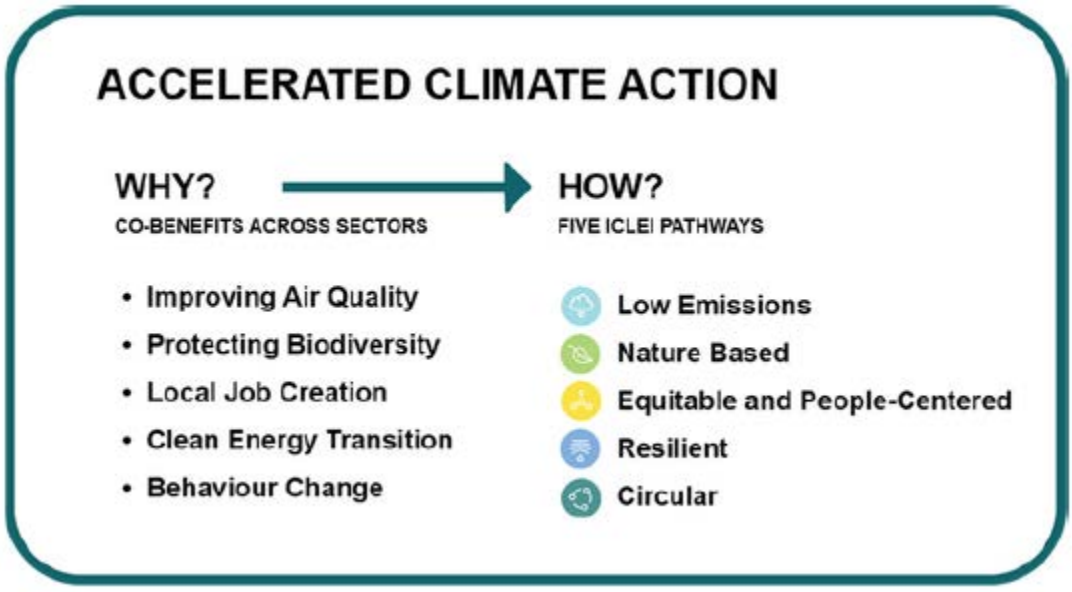


Figure 2. Co-Benefits and Pathways to Accelerated Climate Action

Even before US EPA presented the CPRG Program opportunity, NOACA and ICLEI USA had determined the need to review existing targets and plans across the region to ascertain the necessary level of ambition and outline how to achieve net-zero emissions by 2050. Any roadmap for regional climate neutrality would require NOACA's stakeholders to identify priority sectors for action, while considering climate justice, inclusiveness, local job creation and other benefits of sustainable development. Therefore, the US EPA NOFO was not a call to start over, but rather an opportunity for NOACA and the City of Cleveland to augment NOACA's regional effort (already underway) and the longstanding, proven planning work by the City to identify and implement climate pollution reduction actions.

The City of Oberlin, in Lorain County, developed the region's first climate action plan (CAP) in 2011. The City of Cleveland, Cuyahoga County, and the City of Lakewood followed suit in 2013, 2019, and 2022, respectively. NOACA and the City of Cleveland will build upon their own work and the work of these communities through the CPRG Program to construct a foundation for transformative action to reduce greenhouse gas emissions, build resilience, and enhance equity in Northeast Ohio. In collaboration with key stakeholders, NOACA and the City of Cleveland will design and conduct a CCAP that integrates local initiatives and identifies opportunities to develop programs and policies at the regional scale.

Key Stakeholder Input

Key Decision-Makers and Technical Stakeholders
NOACA has engaged hundreds of key decision-makers and technical stakeholders during the past two years. Figure 3 illustrates a timeline of significant climate action planning events and deliverables, along with key stakeholder groups and a schedule of engagement to achieve milestones. Figure 4 demonstrates the relational process by which these decision-makers and stakeholders interacted with one another to produce major deliverables.

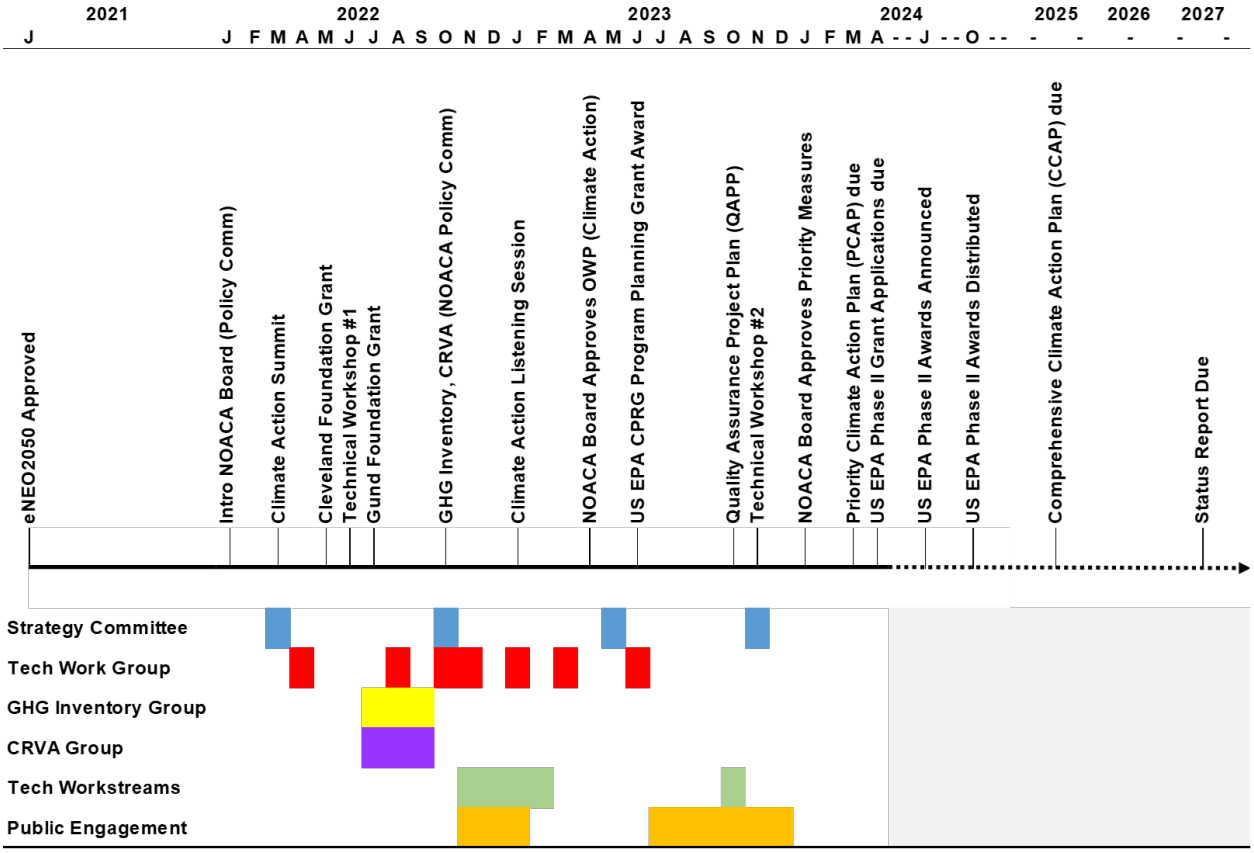


Figure 3. Climate Action Planning Timeline of Key Events and Stakeholder/Public Engagement

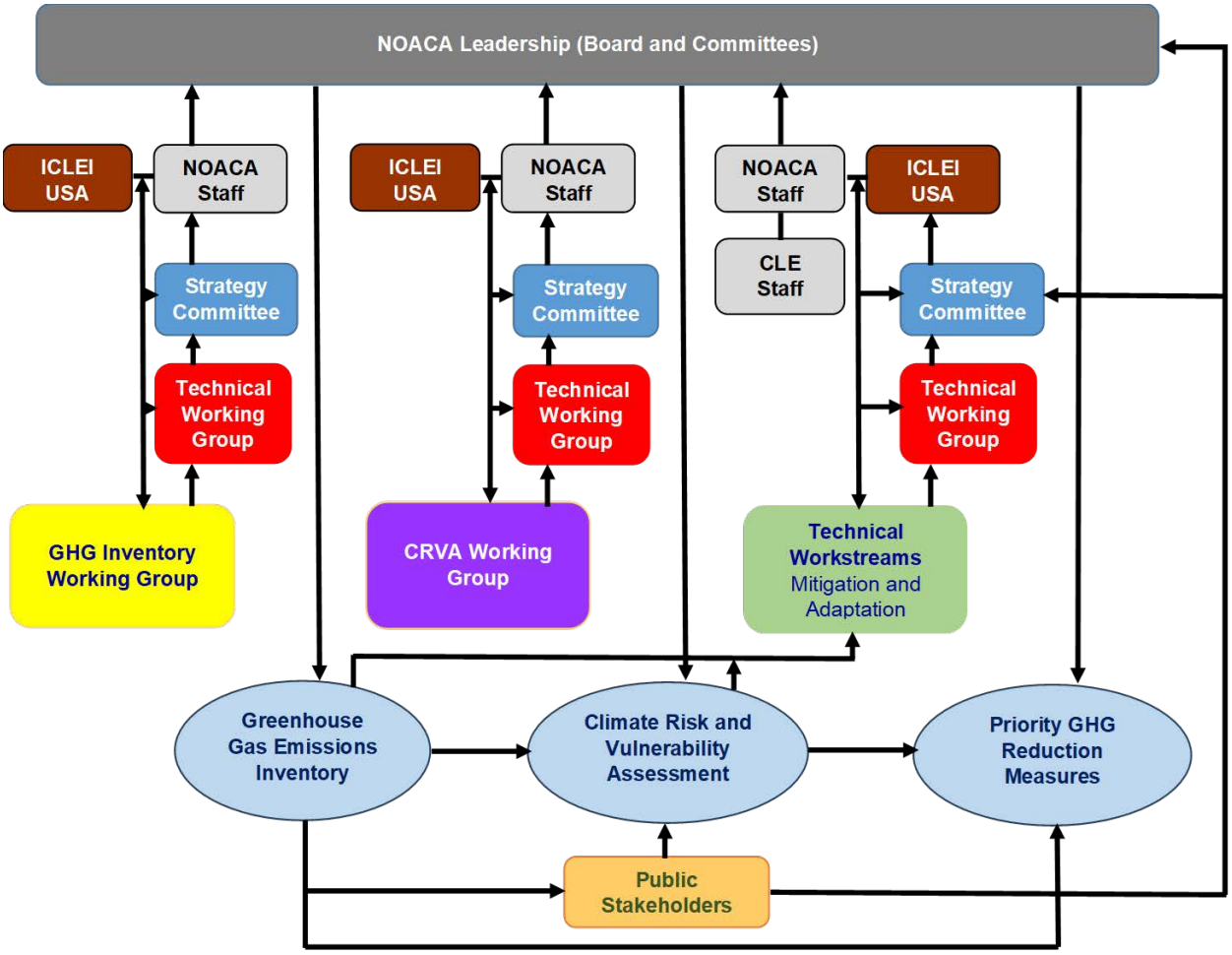


Figure 4. Development of Key Deliverables from Professional, Technical Stakeholder and Public Inputs

On March 15, 2022, NOACA hosted an invitation-only virtual Climate Action Summit. Over 200 decision-makers and technical stakeholders attended. The Summit featured the following highlights:

1. Announced partnership with the George Gund Foundation and the Cleveland Foundation in support of the regional CAP
2. Beth Osborne, Executive Director of Transportation for America, gave the keynote address
3. Video messages in support of climate action from U.S. Senator Sherrod Brown and U.S. Representatives Marcy Kaptur and David Joyce
4. Panel discussions led by NOACA partners, the George Gund Foundation and Cleveland Foundation
5. Call to action to join NOACA's efforts through a pledge of their commitment to climate mitigation and adaptation solutions through NOACA Live, the new MindMixer platform

After the Summit, NOACA staff organized several groups of stakeholders over the next several months, who met to satisfy different objectives (all members listed, with their organizational affiliations, under Acknowledgements):

- **Strategy Committee:** The Strategy Committee included over 50 leaders and elected officials from government, business, and non-profit entities across the five-county MSA. The committee's primary purpose was to oversee NOACA's climate action planning program and provide feedback on input from the working groups and workstreams to inform major deliverables.
- **Technical Working Group:** The Technical Working Group includes representatives of the same organizations as the leaders on the Strategy Committee. The Technical Working Group met much more frequently than the Strategy Committee and directly oversaw outputs from the working groups and workstreams.
- **GHG Inventory Working Group:** The GHG Inventory Working Group collaborated directly with NOACA staff and ICLEI USA to refine the inventory development strategy; identify sources of GHG emissions data; resolve technical roadblocks; and provide draft inventory review.
- **CRVA Working Group:** The CRVA Working Group collaborated directly with NOACA staff and ICLEI USA to refine the CRVA development strategy; identify sources of climate risk and vulnerability data; identify communities most vulnerable to climate change impacts; and provide draft CRVA review.
- **Technical Workstreams:** There are two groups of technical workstreams - mitigation and adaptation. The Mitigation Workstreams (Clean Energy, Clean and Efficient Buildings, Clean Transportation, Efficient Industry and Resilient Economy) collaborated with the GHG Inventory Working Group, NOACA staff and ICLEI USA to recommend GHG reduction goals and identify and rank mitigation goals and actions. The Adaptation Workstreams (Resilient Environment and Resilient People) collaborated with the CRVA Working Group, NOACA staff and ICLEI USA to provide input on the CRVA and recommend adaptation/resilience goals. All workstreams developed action plans with goals, objectives and strategies that informed the content for Technical Workshop #2 (Regional Climate Action Priorities), held in November 2023.

On June 28, 2022, NOACA staff launched its first of two Technical Workshops to engage stakeholders. This workshop provided several hours of presentation and interactive discussion for more than 30 participants over two days, with specific focus topics for each day. Day One featured NOACA's climate action planning approach; climate goals and targets (including science-based target setting, goals, and targets from existing local plans in Northeast Ohio and other regions); and overall reporting framework and planning structure. Day Two featured the first two deliverables: GHG Emissions Inventory and CRVA. The Inventory and Business as Usual (BAU) Forecast segment emphasized comprehensive inventory planning; data needs and information requests; tools to develop the inventory and forecast; and potential mitigation priorities. The CRVA segment emphasized interactive break-out sessions around climate hazards; vulnerable populations and social equity; tools to conduct assessment and identify adaptive capacity; and potential adaptation priorities.

On November 28-29, 2023, NOACA staff partnered with ICLEI USA to design and facilitate two full-day workshops for regional stakeholders:

- Day 1 – Adaptation: ICLEI USA presented the outcomes of the regional CRVA and facilitated a stakeholder engagement session to identify climate adaptation actions.
- Day 2 – Emissions Reduction: ICLEI USA presented the outcomes of the regional GHG Inventory and facilitated a stakeholder engagement session to identify climate mitigation actions. The workshops included a combination of top-down informational and educational content and small group interactive activities.

NOACA staff invited all members of its Board, all members of its Strategy Committee, and a select number of emergency management officials. In addition to the stated purposes above, NOACA's invitation informed individuals that ICLEI USA assembled an initial list of potential actions based on the action plans created through NOACA's Adaptation and Mitigation Workstreams, along with input from the public engagement activities NOACA hosted during November 2022-January 2023 and July-October 2023. NOACA staff requested that each invitee review and respond regarding these actions (thumbs up, thumbs down, anything missing?). NOACA staff also requested input from each invitee on who would implement these actions (i.e., which entity would take the lead?).

After the workshop, ICLEI USA prepared a comprehensive report that summarized the outputs from each day's interactive exercises and engagements (see Appendix A). NOACA staff shared this report with all invitees on December 22, along with links to the workshop presentations and audio recordings. NOACA gathered additional input from these post-workshop comments and, along with the workshop report, assessed which of the numerous GHG emissions reduction measures rose to the top based on emissions reduction potential, co-benefits, feasibility, and priority (see later section for more details).

Public Stakeholder Engagement

NOACA staff implemented two primary climate action planning public engagement campaigns: November 2022-January 2023 and July-October 2023. Each campaign had different objectives and consisted of different engagement approaches, including direct engagement of LIDACs.

The first campaign placed more emphasis on general education and awareness about climate action impacts and NOACA's initiative to develop a program and a regional CAP. Some outreach examples included:

- Podcast from the *NOACA Report*, *Lunch-and-Learn* series; various messaging from digital platforms; and distribution of collateral materials and tools to provide information, education, and awareness about key climate elements, impacts and data, and participation opportunities
- January 10, 2023, Hybrid Virtual/In-person Listening Sessions throughout the MSA region, including site meetings in each of the five counties.
- Distribution of climate information, data, and analysis ("Climate Conversations in a Box") to assist stakeholders, decision makers and influencers with local climate discussion and feedback (see Figure 5)
- Installed two interactive kiosks at 15 library and event locations throughout the five counties to educate residents on GHG Inventory data to seek public comments

- Delivery of in-person presentations for stakeholder groups and audiences
- Surveys, key informant interviews, and collateral materials (Figure 6) developed for deployment during plan deliverable timeframes
- Created over 1200 social media impressions and 125,000 + reactions across digital platforms (Figure 7; summary of engagement highlights in Figure 8)

Figure 5. Sample Climate “Conversation in a Box” and Materials used for Public Engagement

Figure 6. Postcards Distributed across the Region to Gain Community Participation.

Figure 7. NOACA Mindmixer Platform (NOACA Live!)[16]

[16] Connected with residents through an online Mindmixer platform to create climate dialog, pose questions, and take surveys and polls around climate planning: 490 active participants. https://noacalive.mindmixer.com/

Figure 8. Highlights of Successful Public Participation Outcomes

The second campaign (July-October 2023) placed more emphasis on input from the public, with two primary objectives:

1. Better understand public perception of risk and vulnerability within their communities and the region
2. Better understand priorities for mitigation and adaptation strategies that public stakeholders will support (both politically and financially)

Figure 9. In-Person Focus Groups (July-October 2023)

The second campaign placed more emphasis, though not exclusively, on LIDACs. NOACA staff recognized that engagement requires more deliberate expansion and extension to reach a wider, more diverse array of audiences. NOACA staff put out a request for proposals (RFP) in February 2023 to solicit applications from potential consultants to lead staff in more robust outreach about climate action strategy implementation. NOACA hired Joel Ratner Community Partners (JRCP) to lead this effort in collaboration with staff to pursue a broader engagement schedule, identify

deliverable input, and denote feedback benchmarks that will inform key implementation elements of the plan. Specific engagement strategies in development include:

- Informational and Focus Group feedback sessions with presentations and questionnaires (see Figure 9)
- Online Input (digital feedback form) on CRVAs, Climate Mitigation and Adaptation Assessments
- Installation of touch screen kiosks in key county libraries to provide on-site awareness and collect input relevant to key questions, information, and action; and
- Climate Fresks (see Figure 10)
    - Interactive, three-hour, game-style format, climate education workshop
    - Consultant-led, with regional data and engagement content tailored to Northeast Ohio regional climate planning process (Figure 11)

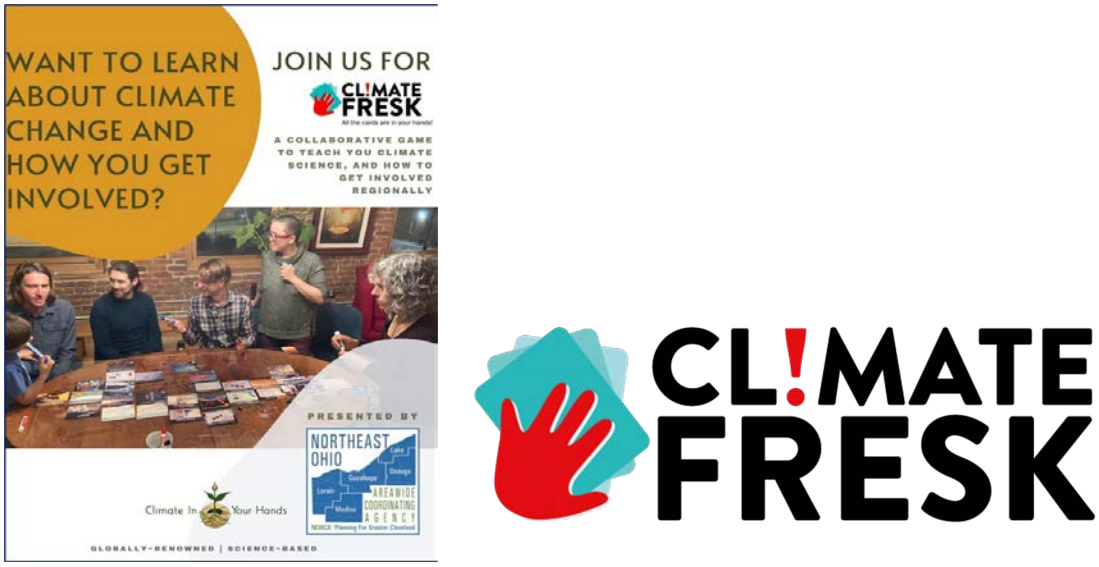


Figure 10. NOACA Climate Fresk Announcement

Of the 30 focus groups hosted by NOACA and its consultant, JRCP, 15 (50%) were in LIDACs. While only two of eight (25%) fresks took place in LIDACs, they included the majority of fresk participants (18 of 30, or 60%). Finally, two of 10 library locations for the kiosks were in LIDACs. Maps to better illustrate the locations of these engagement events with respect to LIDACs are part of the LIDAC Benefits Analysis.

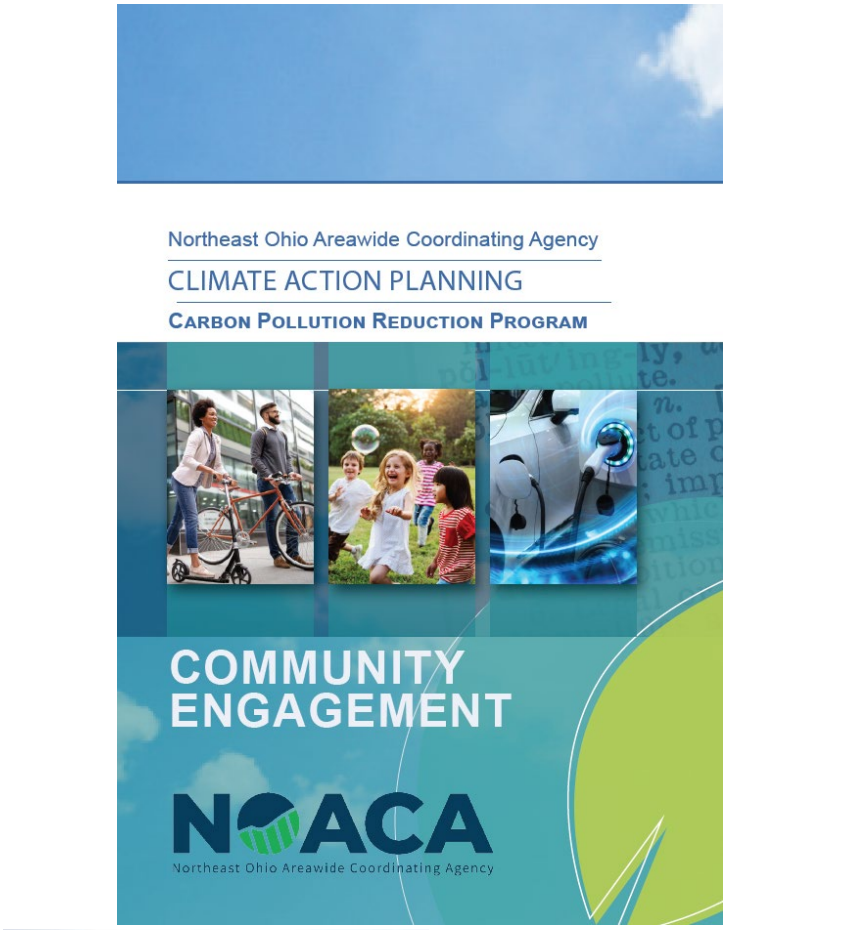


Figure 11. Eight-Page Community Engagement Booklet

PCAP Measure Identification, Prioritization and Selection

ICLEI USA presented 60 potential actions to stakeholders at the Regional Climate Action Priorities Workshop in November 2023. Attendees rated actions based on co-benefits, feasibility, and priority. Through additional discussion, attendees also generated requests for agricultural activity emissions and measures to reduce emissions from refrigeration. More input on priority measures came from the NOACA staff request of workshop invitees for post-workshop feedback.

NOACA staff analyzed all these inputs and prioritized potential actions that rated higher among the criteria of GHG emissions reduction potential, co-benefits, feasibility, priority, and inclusion in other local climate action plans. This prioritization exercise narrowed the list of potential actions from 60 to just under 40. NOACA staff then grouped these potential actions into 10 broader priority measures for the region. Table 1 shows the 10 measures, the sector(s) for which these measures will help reduce GHG emissions and a composite assessment of co-benefits, feasibility, and priority (high, medium, low) of each measure according to stakeholder feedback from the Regional Climate Action Priorities workshop and post-workshop.

Table 1. Priority Measures and Stakeholder Assessment of Co-Benefits, Feasibility and Priority

MEASURE	SECTOR(S)	CO-BENEFITS	FEASIBILITY	PRIORITY
Clean Electricity	Buildings, Electricity Generation, Industry			
Building Efficiency and Electrification	Buildings, Electricity Generation			
Green Steel Production	Industry			
Vehicle Miles Traveled (VMT) Reduction	Transportation			
Light Duty Vehicle Electrification	Transportation, Electricity Generation			
Heavy Duty Vehicle Electrification	Transportation, Electricity Generation			
Refrigerants Capture	Waste Management			
Solid Waste Diversion	Buildings, Waste Management			
Nature-Based Solutions	Agriculture/Natural and Working Lands, Carbon Removal			
Agriculture Actions	Agriculture/Natural and Working Lands			

HIGH MEDIUM LOW

ICLEI USA used its ClearPath[17] model to project emissions reductions from the 10 priority measures presented in Table 1. These measures are implementable across the region and have sufficient impact and a high likelihood of moving forward. The assumptions, proposed actions and projected emissions reductions are presented with the priority measures later in the PCAP.

[17] ICLEI USA, ClearPath (https://icleiusa.org/clearpath/).

Authority to Implement PCAP measures

The existing or needed authority to implement PCAP priority measures by grantees and partnering or other organizations is part of each priority measure's assessment later in the PCAP.

2 MSA Context

NOACA's Precursors to its Climate Pollution Reduction Program

NOACA historically provided support to entities within its region that have embarked on climate action planning efforts (e.g., City of Cleveland, Cuyahoga County, Greater Cleveland Regional Transit Authority). NOACA also has a longstanding practice of environmental planning for, and beyond, its five counties (Cuyahoga, Geauga, Lake, Lorain, Medina).

Water Quality

In accordance with Section 208 of the federal Clean Water Act (CWA), NOACA is the federally designated areawide water quality management planning agency for the five-county Northeast Ohio Lake Erie Basin (NEOLEB) planning area. NOACA serves as both an Areawide Agency, one of six such entities approved by the Governor within the State of Ohio, and a Rideshare/Air Quality Planning Agency.

Air Quality

NOACA continues its efforts to assist the State of Ohio in addressing Northeast Ohio's air quality concerns. The region is currently designated as being in "moderate nonattainment" of EPA air quality standards for ground-level ozone pollution, and U.S. EPA re-designated the region to "maintenance" for particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide, and lead pollution. NOACA works to help Ohio improve air quality through the efforts of staff, working groups, task forces and subcommittees, and through Board actions. NOACA serves as the Clean Air Act (CAA) Section 174 lead planning organization for transportation-related air quality issues.

Long-Range Planning

Coordinated planning at the regional scale that results in a framework and plan for climate action (climate pollution reduction) will enable Northeast Ohio to compete for and receive future funding allocated for projects to adapt infrastructure and systems. A guiding principle for this effort is the creation of a structure that enables coordination and collaboration within the region that lessens the burden on local communities. NOACA undertakes this work as part of the implementation of *eNEO2050*, the long-range plan adopted by NOACA's Board in 2021.[18]

NOACA sought public input from a geographically and demographically representative sample of its adult population. NOACA wanted specifically to expand upon the range of topics for the *eNEO2050* regional survey, beyond transportation, as well as pursue a sample size large enough to ensure the results would be statistically significant at desired levels of confidence and error. The questionnaire for *eNEO2050* was designed to maximize the number of survey respondents through an engaging, online experience. Reporting documents included data subsets, recommendations, presentations, advocacy, follow-up, and ongoing support.

[18] eNEO2050: An Equitable Future for Northeast Ohio (https://www.eneo2050.com/).

The NOACA Regional Survey provided respondents several statements about climate change and, for each, asked whether they agreed or disagreed:

1. Climate change is real.
2. Human behavior contributes to climate change.
3. Northeast Ohio is prepared for climate change.
4. My efforts will help do something about climate change.

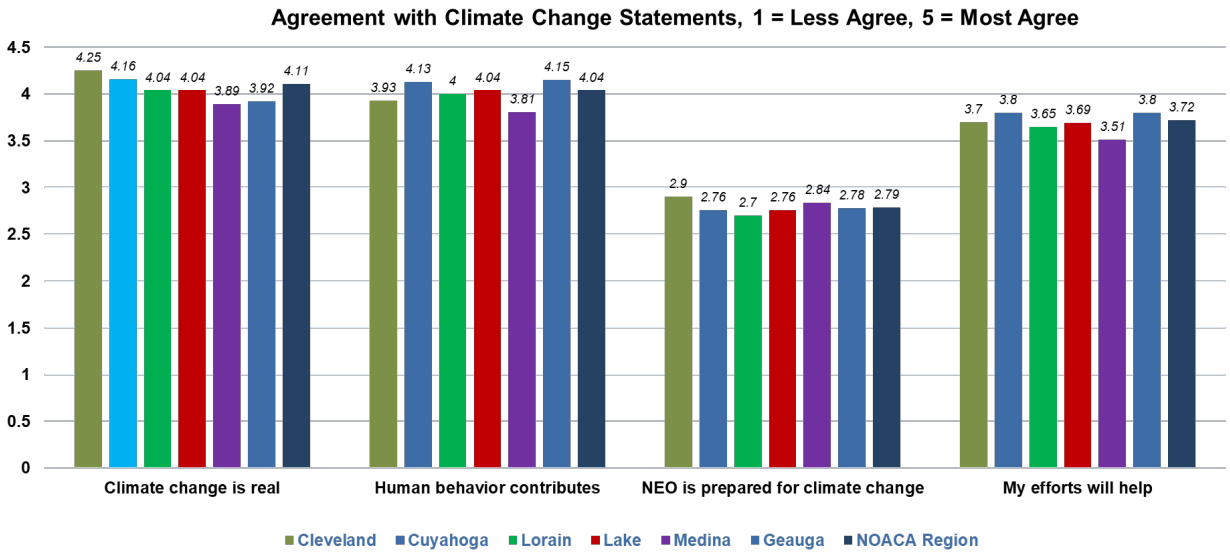


Figure 12. 2020 NOACA Regional Survey: Agreement with Climate Change Statements

Figure 12 shows general agreement among respondents that: 1) Climate change is real; and 2) Human behavior contributes to climate change. Although there is some variation in strength of agreement among geographic units on both statements, regional scores average higher than 4.00. It is interesting to note that the City of Cleveland respondents agree most strongly with the first statement, while Geauga County respondents agree most strongly with the second statement. Medina County respondents, on the other hand, agree the least with both statements. Figure 12 also shows general agreement among respondents that individual efforts can make a positive difference toward action about climate change. Again, Medina County respondents agree the least. Despite agreement about the reality of the problem, Figure 12 reveals that respondents do not agree that Northeast Ohio is prepared for climate change. This disagreement is not very strong, but the sentiment is consistent across geographic units and marks a substantial gap between problem recognition and confidence in the future. These responses have helped frame the problem of climate change for policy makers and elected officials in Northeast Ohio.

	NOACA Region	Cleveland	Cuyahoga County (no CLE)	Lorain	Lake	Medina	Geauga
Road repair and maintenance	$14.40	$20.37	$13.17	$11.88	$14.69	$13.84	$10.78
Reduce climate change impacts	$14.15	$20.57	$13.11	$13.05	$13.48	$11.17	$9.02
Cleaner rivers and lakes	$13.57	$19.78	$12.63	$12.84	$10.88	$12.26	$9.00
Cleaner drinking water	$13.56	$21.82	$12.12	$11.79	$11.17	$12.47	$7.65
Hyperloop CLEVELAND-CHICAGO	$12.78	$15.38	$12.39	$12.48	$12.39	$11.87	$9.49
Cleaner air	$12.73	$20.47	$11.40	$11.01	$10.38	$11.42	$8.25
V2I (vehicle-to-infrastructure comm)	$10.81	$15.91	$9.50	$9.68	$10.36	$10.48	$8.59
Hyperloop CLEVELAND-PITTSBURGH	$10.77	$14.77	$9.82	$9.43	$10.97	$11.07	$6.91
Transportation hub	$10.16	$13.69	$9.39	$9.19	$8.20	$11.48	$9.30
Commuter rail I-480 route	$8.07	$12.87	$7.87	$6.46	$5.03	$6.54	$6.39
Brownfield cleanup & redevelop	$8.03	$13.05	$7.02	$6.47	$5.94	$8.72	$7.01
Improve movement of goods	$7.93	$13.38	$6.61	$7.26	$6.37	$6.54	$8.25
Smart crosswalks	$7.24	$13.50	$5.33	$6.32	$6.33	$7.12	$6.91

Figure 13. Monthly Personal Income Respondents are Willing to Invest

Figure 13 shows a list of potential actions or projects and the willingness of respondents to invest in such projects, based on how much money each respondent is willing to spend (per month) for each project out of their personal income. Out of the 13 actions or projects shared with respondents, “reduce climate change impacts” ranks 2nd overall in terms of average monthly personal income respondents are willing to invest. “Cleaner rivers and lakes” (3rd), “cleaner drinking water” (4th) and “cleaner air” (6th) are close behind. While there is some variation across NOACA’s geographies (City of Cleveland respondents willing to spend the most; Geauga County respondents willing to spend the least), the overall willingness to spend personal resources reflects the value respondents place on climate change mitigation and environmental pollution reduction.

This type of feedback prompted staff to include a series of next steps related to climate action in the final version of *eNEO2050*, approved by the NOACA Board of Directors in June 2021.[19]

- Collaborate with NOACA members, community partners, and stakeholders to define a regional carbon reduction goal and priority actions to achieve it by 2050.
- Establish a Climate Resilience working group to advance programs and projects aimed at mitigating impacts of future conditions on natural resources, transportation infrastructure, and disproportionately impacted areas.
- Provide technical assistance to NOACA membership on development of local Climate Action Plans/Climate Adaptation Plans.
- Address the region’s resilience to climate impacts by identifying the adaptive capacity through a comprehensive assessment of vulnerability to natural hazards directly impacting and impacted by transportation, water and air quality and related comprehensive planning.

[19] Northeast Ohio Areawide Coordinating Agency Resolution 2021-014: eNEO2050 - NOACA Long-Range Plan (https://www.noaca.org/board-committees/noaca-board-and-committees/board-resolutions).

NOACA's Climate Pollution Reduction Program

NOACA staff developed a detailed framework for its climate action planning effort through NOACA's Overall Work Program (OWP).[20] This program advances NOACA's efforts toward the development, implementation and maintenance of a framework and plan for climate action (climate pollution reduction). The program reduces emissions pollution that causes climate impacts and harms human health, mitigates the effects of extreme weather, helps communities adapt to changes that may occur, particularly relative to infrastructure, and builds resilience. These efforts will prepare the region to reduce overall GHG emissions and develop projects and activities to increase resilience in the face of challenging climate conditions. NOACA staff will support member communities as they develop local plans, projects, and enact local regulation and policy consistent with regional goals.

A primary objective of a regional framework and plan for climate action (climate pollution reduction) is to create a foundation for transformative solutions that will enhance equity across the region, especially as defined by geographic and demographic disparities in exposure to climate pollutants and hazards, and particularly as it relates to clean air and clean water as well as sound and reliable infrastructure. When completed and adopted, NOACA will coordinate the programming and implementation of its approved framework and plan that will integrate local initiatives and identify opportunities to develop additional programs and policies at the regional scale.

Northeast Ohio Local CAPs

The Cleveland-Elyria MSA PCAP builds on previous and ongoing efforts of vanguard jurisdictions and organizations to tackle GHG emissions and climate change through their own local CAPs. The introductory section of this PCAP mentioned these efforts, but it is worthwhile to examine a comprehensive snapshot of their focus areas and the support they provide for a regional PCAP. Table 2 provides this snapshot. All six local climate action planning efforts, the year(s) they (or their updates) received approval, and the focus areas of each CAP are part of a simple matrix to illustrate clear patterns. It is noteworthy that focus areas such as energy and transportation are within each CAP; these are dominant sectors of GHG emissions presented in the next section. These sectors are also, therefore, the greatest opportunities for emissions reduction.

In addition to the plans and focus areas in Table 2, it is also important to note that some of these plans (i.e., City of Cleveland[21] and Cuyahoga County) are currently in process for another update. Other, new climate action planning efforts (i.e., City of Cleveland Heights[22]) are in development. The Cleveland-Elyria MSA PCAP will provide an even stronger foundation for these efforts and hopefully encourage other new initiatives in jurisdictions throughout the region. The CCAP will include an update on Northeast Ohio local CAP development.

[20] NOACA Overall Work Program (https://www.noaca.org/regional-planning/major-planning-documents/overall-work-program-owp).
[21] City of Cleveland. October 12, 2023. Cleveland Climate Action Plan updates underway for 2023-2024 (retreived 2.14.2024 from https://www.clevelandohio.gov/news/cleveland-climate-action-plan-updates-underway-2023-2024).
[22] City of Cleveland Heights. August 21, 2023. Cleveland Heights assembles climate action team (retrieved 2.14.2024 from https://www.clevelandheights.gov/civicalerts.aspx?aid=726).

Table 2. Northeast Ohio Local Climate Action Plan Focus Areas[23]

FOCUS AREAS	CLEVELAND (2013, 2018)	CLEVELAND-CUYAHOGA COUNTY PORT AUTHORITY (2023)	CUYAHOGA COUNTY (2019)	GREATER CLEVELAND REGIONAL TRANSIT AUTHORITY (2022)	LAKEWOOD (2023)	OBERLIN (2011, 2013, 2019)
BUILDINGS	Energy efficiency and green building	Buildings and facilities			Efficient, healthy buildings for all	
ENERGY	Clean energy	Renewable energy	100% renewable energy by 2050	Produce 2% of GCRTA's electricity needs on-site; Use 100% clean energy sources	Clean electricity for all	Energy use
HEALTH	More local food, less waste		Extreme weather. Extreme heat. New diseases. New stresses. Be prepared and ready.		Extreme weather emergency management	Food and agriculture
LAND USE	Vibrant green space		Develop wisely, More trees and greenspace.		Protected and enhanced natural spaces	Land use
NATURAL SYSTEMS	Clean water		Understand what's coming. Expand and Protect what's here.			
OPERATIONS/ FACILITIES		Marine operations		Reduce emissions from facilities; Prepare facilities to service additional non-diesel vehicles	The role of the city	Resilience
RIDERSHIP				Meet aspirational ridership goals through both GCRTA strategies and regional policies		
TRANSPORTATION	Sustainable transportation	Vehicles and equipment	Cleaner Fuel Vehicles. More Public Transit, Biking, and Walking.	Reduce GHG emissions/VMT from fleet; convert to 100% zero emissions fleet; reduce	Rethinking transportation	Transportation
WASTE					Waste and wastewater	Waste
WATER					Water	Water

[23] Cleveland Climate Action Plan (https://www.clevelandohio.gov/city-hall/office-mayor/sustainability/cleveland-climate-action-plan); Port of Cleveland (https://www.portofcleveland.com/strategic-plan/); Cuyahoga County Climate Change Action Plan (https://www.countyplanning.us/projects/climate-action-plan/); Federal Transit Administration, GCRTA Climate Action Plan (https://www.transit.dot.gov/regulations-and-programs/environmental-programs/gcrta-climate-action-plan); Lakewood Climate Action Plan (https://www.lakewoodoh.gov/planning-development-projects-programs/); Oberlin's Climate Action Plan (https://cityofoberlin.com/city-government/departments/sustainability/).

3 PCAP Elements

3.1 Greenhouse Gas (GHG) Inventory

Key Findings

The Cleveland-Elyria MSA Regional GHG Emissions Inventory: 2018 Baseline identifies baseline emissions levels, sources and activities that generate emissions in the five counties of the region. The total emissions by sector for the Cleveland-Elyria MSA are in Figure 14. The largest contributors are Residential Energy and Transportation (25% each), followed by Industrial Energy (19%) and Commercial Energy (18%). Actions to reduce emissions in all of these sectors are essential. Solid Waste, Process & Fugitive Emissions, Water & Wastewater, HFCs (Refrigerants) and Agriculture were responsible for the remaining (less than 13%) emissions. Forests and trees outside of forests sequester approximately 3% of total emissions. These data will also provide a baseline against which NOACA and the City of Cleveland will be able to compare future performance and demonstrate progress in reducing emissions.

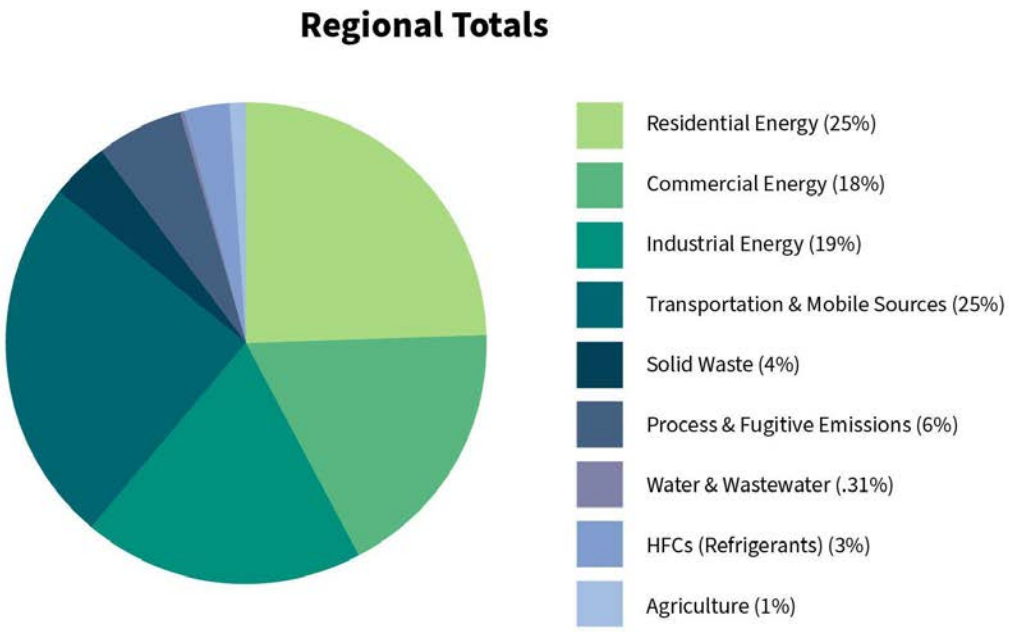


Figure 14. 2018 Total Regional Emissions by Sector

Inventory Methodology

Understanding a GHG Emissions Inventory

The first step to achieving tangible GHG emission reductions requires the identification of baseline emissions levels, sources, and activities in the community/region. The PCAP presents emissions from the Cleveland-Elyria MSA as a whole. The government operations inventory is mostly a subset of the community inventory, as shown in Figure 15. For example, data on commercial energy use by the community include energy consumed by municipal buildings, and community vehicle miles traveled (VMT) estimates include municipal fleet vehicle miles.

Figure 15. Relationship of Regional and Government Operations Emissions Inventories

As local governments continue to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Community Protocol), as described below.

Four greenhouse gases are included in this inventory: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and hydrofluorocarbons (HFCs). Other gases (i.e., PFCs, SF_6, and NF_3) are a very small percentage of emissions nationally, so they are not in the current Cleveland-Elyria MSA GHG inventory (i.e., not a priority focus for emissions reduction efforts).

The inventory tables represent emissions in "carbon dioxide equivalent" (CO_2e) values, calculated using the Global Warming Potentials (GWP) for methane and nitrous oxide from the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (see Table 3).

Table 3. Global Warming Potential Values[24][25]

Greenhouse Gas	Global Warming Potential
Carbon Dioxide (CO2)	1
Methane (CH4)	28
Nitrous Oxide (N2O)	265

Regional Emissions Protocol

ICLEI released Version 1.2 of the Community Protocol in 2019,[26] and represents a national standard in guidance to help local governments develop effective community GHG emissions inventories. It establishes reporting requirements for all community GHG emissions inventories and provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities. Version 1.2 also provides a number of optional reporting frameworks to help local governments customize their community GHG emissions inventory reports based on their local goals and capacities.

The initial regional inventory in this report included emissions from the five Basic Emissions Generating Activities required by the Community Protocol. These activities are:

- Use of electricity by the region
- Use of fuel in residential and commercial stationary combustion equipment
- On-road passenger and freight motor vehicle travel
- Use of energy in potable water and wastewater treatment and distribution
- Generation of solid waste by the region

The regional inventory also includes the following activities to make it a Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) Basic-compliant inventory:

- Wastewater treatment processes
- Rail, marine and off-road transportation

[24] Intergovernmental Panel on Climate Change 5th Assessment Report. 2014. Retrieved 10.15.2022 from https://www.ipcc.ch/assessment-report/ar5/.
[25] HFCs are not included in this table because the downscaling approach used data already in units of CO_2e. The GWP of HFCs varies widely depending on the specific compound.
[26] ICLEI. 2019. US Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Retrieved 10.1.2022 from https://icleiusa.org/us-community-protocol/).

- Forest and trees
- Industrial processes
- Scope 3 air travel

After the initial regional inventory, the team also added HFCs (Refrigerants) and agriculture sector emissions, based on the outline of GHG emissions sectors in the US EPA CPRG Program Guidance[27] and feedback during NOACA's climate pollution reduction outreach and engagement efforts in 2023.

Data Collection Methodology and Data Source Details

The team collected data from a variety of entities in the region, including electric, gas, water, and wastewater utilities. The following tables (Tables 4, 5 and 6) provide data source details for each sector. The team treated HFCs and agriculture emissions a bit differently (see below).

Table 4. Energy Data Sources with Estimation Applied

Activity	Data Source	Data Gaps/Assumptions
Region-wide		
Residential Electricity	Firelands Electric Cooperative	Estimated by dividing total usage for utility equally to each county that it operates in.
Residential, Commercial, and Industrial Energy Natural Gas Consumption	Columbia Gas of Ohio	Includes agricultural data.
	Northern Industrial Energy Development	Estimated by dividing total usage for utility equally to each county that it operates in.
	Northeast Ohio Natural Gas	Estimated by dividing total usage for utility equally to each county that it operates in.
	Knox Energy Cooperative	Estimated by dividing total usage for utility equally to each county that it operates in.

[27] United States Environmental Protection Agency Office of Air and Radiation. March 1, 2023. Climate Pollution Reduction Grants Program: Formula Grants for Planning - Program Guidance for States, Municipalities, and Air Pollution Control Agencies (retrieved 1.31.2024 from https://www.epa.gov/inflation-reduction-act/about-cprg-planning-grant-information).

Table 5. Emissions Factors for Electricity Consumption

Year	CO2 (lbs./MWh)	CH4 (lbs./GWh)	N2O (lbs./GWh)	Data Gaps/Assumptions
Cleveland Public Power / 2018	1,036	0.117	0.017	From Cuyahoga County's 2018 GHGI.
First Energy / 2018	953	0.117	0.017	From Cuyahoga County's 2018 GHGI.
City of Painesville / 2018	3,833.58	0.0000438	0.0000372	From Painesville Municipal Electric.

Table 6. Wastewater Data Sources with Estimation Applied

Activity	Data Source	Data Gaps/Assumptions
Region-wide		
Wastewater Energy	City of Elyria	Information only; usage most likely included in the commercial/industrial energy usage.
Wastewater Energy	Northeast Ohio Regional Sewer District	Information only; usage most likely included in the commercial/industrial energy usage.
Combustion of Digester Gas	Lake County	Based on number of sewer accounts.
N2O from Effluent Discharge	Lake County	Based on number of sewer accounts and estimated emissions for small utilities in which no data was received.
N2O from Effluent Discharge	Cuyahoga County	Estimated emissions for small utilities in which no data was received.
N2O from Effluent Discharge	Medina County	Estimated emissions for small utilities in which no data was received.
N2O from Effluent Discharge	Lorain County	Estimated emissions for small utilities in which no data was received.
N2O from Effluent Discharge	Geauga County	Estimated emissions for small utilities in which no data was received.
N2O from Effluent Discharge	Lake County	Estimated emissions for small utilities in which no data was received.

Inventory Calculations

The 2018 inventory was calculated following the US Community Protocol and ICLEI's ClearPath software. As mentioned earlier and described in detail below, the team used global warming potential (GWP) values to convert methane and nitrous oxide to CO_2e units. ClearPath's inventory calculators allow for input of the sector activity (i.e., kWh or VMT) and emission factor to calculate the final CO_2e emissions. For agriculture and HFC (Refrigerants) emissions, the

team downscaled total CO_2e emissions from state level data (agriculture) and national data (refrigerants).

Quantifying Greenhouse Gas Emissions

Sources and Activities

Communities contribute to greenhouse gas emissions in many ways. Two central categorizations of emissions are used in the community inventory: 1) GHG emissions that are produced by "sources" located within the community boundary, and 2) GHG emissions produced because of community "activities" (Table 7).

Table 7. Source vs. Activity for Greenhouse Gas Emissions (GHG)

Source	Activity
Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions.

Local governments can develop and promote a deeper understanding of GHG emissions associated with their communities by reporting on both GHG emissions sources and activities (Table 8). A purely source-based emissions inventory could be summed to estimate total emissions released within the community's jurisdictional boundary. In contrast, a purely activity-based emissions inventory could provide perspective on the efficiency of the community, even when the associated emissions occur outside the jurisdictional boundary. The GPC applies a division of community emissions into Scopes 1, 2 and 3, rather than sources and activities. The source category is equivalent to Scope 1, while activities comprise Scope 2 and Scope 3 (Figure 16).

Table 8. Sources and Activities by Sector

Stationary Energy	Transportation	Waste	Industrial Processes and Product Use	Agriculture, Forestry and Other Land Use
Building and facility energy consumption **Manufacturing facility** using non-grid energy sources **Equipment** used for industrial, construction, agriculture, and other similar activities **Fugitive emissions** from oil and natural gas systems	**On-road** travel, such as private automobiles and commercial trucks and busses **Rail** travel, including both public and commercial transport **Air** and **water** travel within the regional boundary	**Solid waste** generated within the regional boundary that is disposed or biologically treated Solid waste generated within the regional boundary that is **incinerated or burned** **Wastewater treatment** within the regional boundary	**Industrial processes** that chemically or physically transform materials **Product use** by industry and end-consumers, including refrigerants and aerosols **Fossil fuels** for non-energy uses, including lubricants and paraffin waxes	**Livestock** and manure management **Land use** including forest land, cropland, grassland, wetlands, and other land uses **Other sources** including biomass burning, rice cultivation, and fertilizer use

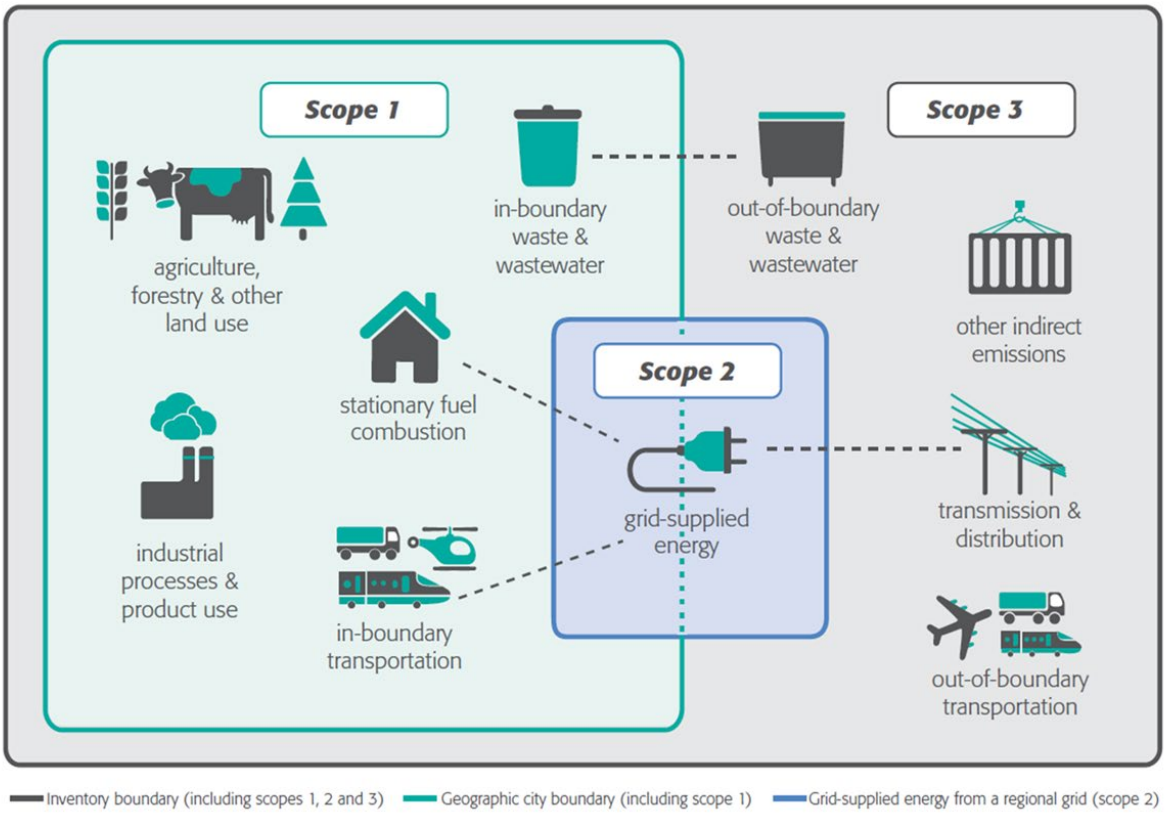


Figure 16. Sources and Activities by Scope

Baseline Year

The inventory process requires the selection of a baseline year with which to compare current emissions. NOACA's regional GHG emissions inventory utilizes 2018 as its baseline year because it was the most recent year for which the necessary data were available (at time of inventory development in 2022). Furthermore, the 2018 data were not impacted by significant changes in activity that occurred during 2020, the year of the global pandemic shutdown.

Quantification Methods

GHG emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of GHG emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Calculation-based methodologies calculate emissions using activity data and emission factors. The basic equation below helps calculate emissions accordingly:

Activity Data x Emission Factor = Emissions

Most emissions sources in the Cleveland-Elyria MSA inventory are quantified through calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see previous tables for a detailed listing of the activity data used in composing this inventory.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g., lbs CO_2/kWh of electricity). For this inventory, the team made calculations with ICLEI's ClearPath tool.

HFCs (Refrigerants) Calculations

ICLEI USA generated an estimate of HFC emissions for the Cleveland-Elyria MSA by downscaling national emissions based on population. Table 9 illustrates their calculations.

Table 9. HFCs (Refrigerants) Calculation[28]

MEASURE	UNIT	VALUE
2018 United States HFC emissions	million $MTCO_2e$	160.9
2018 United States population	million persons	327
2018 United States HFC emissions per capita	$MTCO_2e$/person	0.49
2018 Cleveland-Elyria MSA population	persons	2,061,983
2018 Cleveland-Elyria MSA HFC emissions (estimate)	$MTCO_2e$	1,014,597

Agriculture Sector Calculations

Agriculture produces emissions from various sources, including livestock enteric fermentation,[29] manure management, and fertilizer use. However, agriculture emissions were not part of the initial calculations because of an anticipated (relatively) small contribution to overall regional GHG emissions compared to transportation and energy use. Agriculture, Forestry and Other Land Uses (AFOLU) (includes agricultural lands, forests and trees outside of forests) both produces emissions (primarily agricultural lands), but also sequesters carbon (primarily forests and trees outside of forests). The team noted that, while carbon can be sequestered in agricultural soils, at the national level this is equal to only about 2% of the carbon sequestration from forests and trees (See Table 10).

[28] United States Environmental Protection Agency. 2023. United States Greenhouse Gas Inventory (retrieved 2.6.2024 from https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Chapter-Executive-Summary.pdf).

[29] Contrary to common belief, it's actually cow belching caused by a process called enteric fermentation that contributes to methane emissions. Enteric fermentation is the digestive process in which sugars are broken down into simpler molecules for absorption into the bloodstream. This process also produces methane as a by-product. However, a small percentage of methane is also produced in the cow's large intestine and released. Additionally, significant amounts of this greenhouse gas are generated in settling ponds and lagoons used for processing cow manure. (National Aeronautics and Space Administration (NASA), Global Climate Change: Vital Signs of the Planet (retrieved 9.30.2023 from https://climate.nasa.gov/faq/33/which-is-a-bigger-methane-source-cow-belching-or-cow-flatulence/#:~:text=Enteric%20fermentation%20is%20the%20digestive,cow's%20large%20intestine%20and%20released)).

Table 10. United States Agriculture Emissions and Sequestration Totals

Emissions/sequestration source	**2018 US Emissions (million metric tons CO_2e)[30]**
Agricultural emissions (other than impact on land carbon stocks)	629.5
Agriculture emissions from conversion of natural ecosystems to cropland	56.3
Sequestration - carbon stored in cropland soils	-16.6

The team initially calculated AFOLU emissions and sequestration with the LEARN tool.[31] The LEARN tool applies the methodology in the US Community Protocol Appendix J,[32] which has also been adopted by the GPC. The LEARN tool combines land cover and tree canopy data from the National Land Cover Database (NLCD), with emissions and sequestration factors developed by experts with the US Forest Service, Woodwell Climate Research Center, and World Resources Institute (WRI). The NLCD is the most comprehensive and up-to-date land cover dataset available for the United States. The NLCD data incorporated in the LEARN tool includes 2019.

While the area covered by forests and trees is a major contributing factor to sequestration, it is not the only factor. It also matters how much forest area is cleared for development or cropland (which can produce substantial emissions). In addition, forest trees and trees outside of forests sequester carbon at different rates because they receive different amounts of sunlight and water. Furthermore, trees planted in settlement areas are often different species from native trees in forests. LEARN is a more sophisticated model that accounts for each of the factors described above.

[30] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021 Agricultural emissions from Table 5-1; all other data from Table 6-1.

[31] ICLEI USA, Global Forest Watch, Woodwell Climate Research Center, United States Community Protocol's Land Emissions and Removals Navigator (LEARN) Tool (retrieved 9.21.2023 from https://icleiusa.org/LEARN/).

[32] ICLEI USA, United States Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix J: Forest Land and Trees (retrieved 9.21.2023) from https://d1ps9kreypzu9a.cloudfront.net/GHGInventory/Appendix%20J%20-%20Forest%20Land%20and%20Trees.pdf).

After the initial regional inventory, the team decided to include agriculture sector emissions (US EPA CPRG Program Guidance and stakeholder/public input). As a first step, the team gathered data from the United States Department of Agriculture (USDA) Agricultural Census (1997-2017) (Table 11).[33]

Table 11. USDA Agricultural Census Data for Cleveland-Elyria MSA (1997-2017)

COUNTY	DATA	YEAR 1997[a]	2017[f]	1997-2017
CUYAHOGA	Farms (#)	118	111	-5.9%
	Land in farms (acres)	4,268	2,248	-47.3%
	% County Land Area in Farms (292,602 acres)	1.5%	0.8%	
	% Ohio Land Area in Farms (13,965,295 acres)	0.031%	0.016%	
GEAUGA	Farms (#)	661	1,049	58.7%
	Land in farms (acres)	59,238	69,907	18.0%
	% County Land Area in Farms (256,102 acres)	23.1%	27.3%	
	% Ohio Land Area in Farms (13,965,295 acres)	0.424%	0.501%	
LAKE	Farms (#)	274	214	-21.9%
	Land in farms (acres)	19,053	13,098	-31.3%
	% County Land Area in Farms (145,594 acres)	13.1%	9.0%	
	% Ohio Land Area in Farms (13,965,295 acres)	0.136%	0.094%	
LORAIN	Farms (#)	778	1,001	28.7%
	Land in farms (acres)	130,631	125,721	-3.8%
	% County Land Area in Farms (314,304 acres)	41.6%	40.0%	
	% Ohio Land Area in Farms (13,965,295 acres)	0.935%	0.900%	
MEDINA	Farms (#)	851	1,149	35.0%
	Land in farms (acres)	104,060	99,325	-4.6%
	% County Land Area in Farms (269,670 acres)	38.6%	36.8%	
	% Ohio Land Area in Farms (13,965,295 acres)	0.745%	0.711%	
MSA	Farms (#)	2,682	3,524	31.4%
	Land in farms (acres)	317,250	310,299	-2.2%
	% MSA Land Area in Farms (1,278,272 acres)	24.8%	24.3%	
	% Ohio Land Area in Farms (13,965,295 acres)	2.272%	2.222%	

[a]https://agcensus.library.cornell.edu/wp-content/uploads/1997-Ohio-CHAPTER_2_County_Data-1600-Table-01.pdf

[f]https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/Ohio/st39_2_0001_0001.pdf

[33] NOACA and the City of Cleveland recognize that USDA released their 2022 Census of Agriculture data on February 13, 2024 (https://www.nass.usda.gov/AgCensus/). However, NOACA and the City of Cleveland use a 2018 Baseline Year for the Cleveland-Elyria MSA GHG emissions inventory and the PCAP; the 2017 Census of Agriculture is closest to that baseline. NOACA and the City of Cleveland will certainly consider the 2022 Census of Agriculture data for a potential update to the MSA GHG emissions inventory and the CCAP.

The team then consulted with local stakeholders who had urged inclusion of agriculture sector emissions about methodologies to calculate those estimates. Stakeholders and the team came to consensus on the estimation of agriculture emissions for each county and the region based on each county's (and the region's) share of the state's land area in farms multiplied by the state total agriculture emissions value, calculated by US EPA (see Table 12).

Table 12. Agricultural Sector Emissions Estimates for the Cleveland-Elyria MSA and its Counties

	Ohio	MSA	Cuyahoga	Geauga	Lake	Lorain	Medina
% of Ohio Farm Acres	100	2.220%	0.016%	0.501%	0.094%	0.900%	0.711%
2018 Emissions (Metric tons CO_2e)[a]							
Agricultural soil management	8,203,000	182,107	1,312	41,097	7,711	73,827	58,323
Enterc fermentation	2,796,000	62,071	447	14,008	2,628	25,164	19,880
Manure management	2,188,000	48,574	350	10,962	2,057	19,692	15,557
Urea fertilization	92,000	2,042	15	461	86	828	654
Field burning of agricultural res	22,000	488	4	110	21	198	156
Liming	45,000	999	7	225	42	405	320
Agriculture total	**13,346,000**	**296,281**	**2,135**	**66,863**	**12,545**	**120,114**	**94,890**

2018 Total Regional Emissions Inventory Results

The total regional emissions for the 2018 inventory are shown in Table 13. Subsequently, individual county emissions and pie charts are in Tables 14-18 and Figures 17-21.

Table 13. 2018 Total Regional Emissions Inventory

2018 Total NOACA GHGI

Sector	Fuel or Source	2018 Usage	Usage Unit	2018 Emissions
Residential Energy	Electricity	7,554,518,825	kWh	3,490,047
	Natural Gas	105,120,498	MMBtu	5,590,991
	Propane	1,170,862	MMBtu	72,662
	Fuel Oil	710,678	MMBtu	52,915
	Residential Energy Total:			**9,206,615**
Commercial Energy	Electricity	7,820,324,931	kWh	4,059,675
	Natural Gas	52,657,203	MMBtu	2,800,652
	Commercial Energy Total:			**6,860,327**
Industrial Energy	Electricity	7,544,525,035	kWh	3,948,447
	Natural Gas	13,890,114	MMBtu	715,151
	Non-Utility Fuels			2,331,815
	Industrial Energy Total:			**6,995,413**
Transportation & Mobile Sources	Gasoline	15,539,152,438	VMT	6,303,888
	Diesel	1,167,907,440	VMT	2,018,766
	Aviation			422,056
	Rail Transportation			6,522
	Public Transit			37,750
	Water Transportation			249,241
	Off-Road			106,369
	Transportation and Mobile Sources Total:			**9,144,592**
Solid Waste	Waste Generation	2,450,730	Tons	1,422,575
	Composting	304,938	Tons	21,232
	Combustion of Solid Waste	890	Tons	308
	Solid Waste Total:			**1,444,115**
Water & Wastewater	Septic Systems			89,524
	Combustion of Digester Gas			19
	Combustion of Biosolids and Sludges			12,480
	N_2O Emissions			14,049
	Water & Wastewater Total:			**116,072**
Process & Fugitive Emissions	Natural Gas Distribution	169,904,636	MMBtu	319,054
	Gas and Oil Wells			587,892
	Other Process and Fugitive			1,148,564
	Process & Fugitive Emissions Total:			**2,055,510**
HFCs (refrigerants)				1,014,496
Agriculture				296,547
Forests and Trees	Removals from Forests			-866,533
	Removals from Trees Outside of Forests			-302,838
	Forests & Trees Total:			**-1,169,371**
	Total Gross Emissions:			**37,133,687**
	Total Emissions with Sequestration:			**35,964,316**

Table 14. 2018 Cuyahoga County Emissions Inventory

2018 Cuyahoga County GHGI

Sector	Fuel or Source	2018 Usage	Usage Unit	2018 Emissions
Residential Energy	Electricity	4,220,828,789	kWh	1,839,880
	Natural Gas	65,899,151	MMBtu	3,504,945
	Propane	497,744	MMBtu	30,889
	Fuel Oil	84,972	MMBtu	6,327
	Res Energy Total:			**5,382,041**
Commercial Energy	Electricity	5,224,248,774	kWh	2,781,715
	Natural Gas	33,380,881	MMBtu	1,775,412
	Commercial Energy Total:			**4,557,127**
Industrial Energy	Electricity	5,566,716,131	kWh	2,964,066
	Natural Gas	4,376,990	MMBtu	232,307
	Non-Utility Fuels			2,242,573
	Industrial Energy Total:			**5,438,946**
Transportation & Mobile Sources	Gasoline	8,763,716,875	VMT	3,534,879
	Diesel	658,621,243	VMT	1,137,775
	Aviation			422,044
	Rail Transportation			6,335
	Public Transit			37,750
	Water Transportation			202,686
	Off-Road			59,275
	Transportation and Mobile Sources Total:			**5,400,744**
Solid Waste	Waste Generation	1,509,312	Tons	876,110
	Composting	185,105	Tons	12,888
	Combustion of Solid Waste		Tons	
	Solid Waste Total:			**888,998**
Water & Wastewater	Septic Systems	242,078		29,412
	Combustion of Digester Gas	83,600	Service Population	8
	Combustion of Biosolids and Sludges			12,480
	N_2O Emissions			11,945
	Water & Wastewater Total:			**53,845**
Process & Fugitive Emissions	Natural Gas Distribution	102,309,483	MMBtu	196,978
	Gas and Oil Wells			143,385
	Other Process and Fugitive			918,180
	Process & Fugitive Emissions Total:			**1,258,543**
HFCs (refrigerants)				614,462
Agriculture				2,135
Forests and Trees	Removals from Forests			-112,866
	Removals from Trees Outside of Forests			-120,900
	Forests & Trees Total:			**-233,766**
	Total Gross Emissions:			**23,596,842**
	Total Emissions with Sequestration:			**23,363,076**

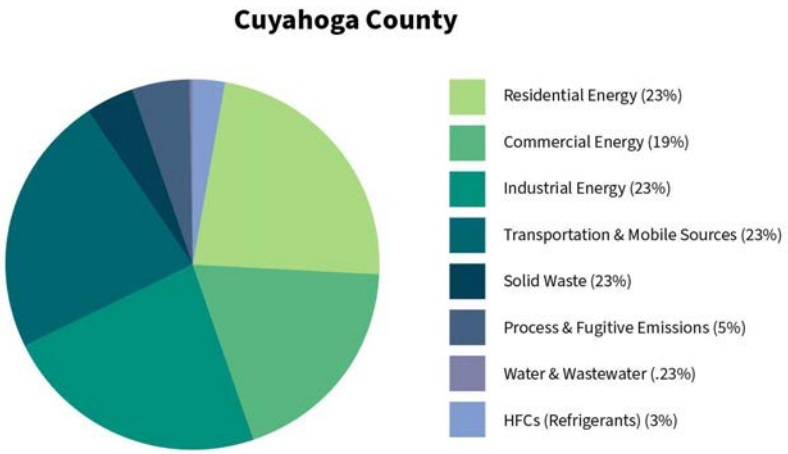


Figure 17. 2018 Cuyahoga County Emissions by Sector

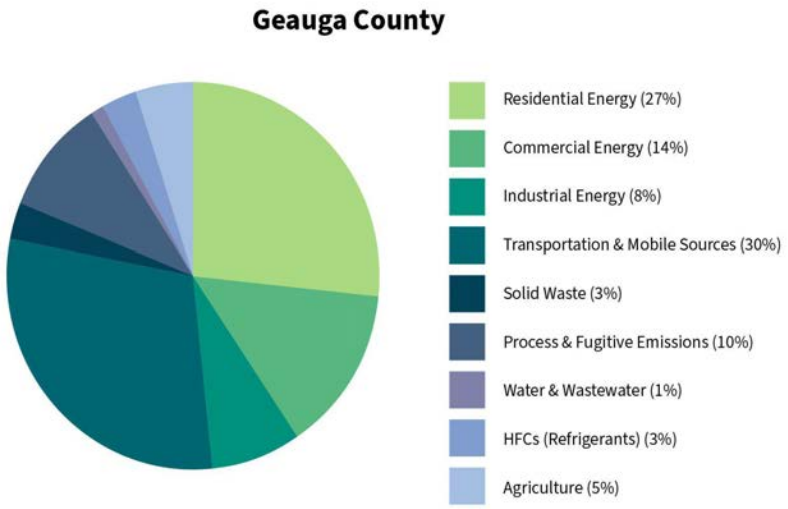


Figure 18. 2018 Geauga County Emissions by Sector

Table 15. 2018 Geauga County Emissions Inventory

2018 Geauga County GHGI

Sector	Fuel Or Source	2018 Usage	Usage Unit	2018 Emissions
Residential Energy	Electricity	480,096,397	kWh	207,535
	Natural Gas	2,614,308	MMBtu	139,046
	Propane	315,188	MMBtu	5,664
	Fuel Oil	91,272	MMBtu	23,468
	Res Energy Total:			**375,713**
Commercial Energy	Electricity	335,961,964	kWh	145,228
	Natural Gas	982,126	MMBtu	52,236
	Commercial Energy Total:			**197,464**
Industrial Energy	Electricity	244,082,189	kWh	105,511
	Natural Gas	56,127	MMBtu	2,978
	Non-Utility Fuels			
	Industrial Energy Total:			**108,489**
Transportation & Mobile Sources	Gasoline	783,783,448	VMT	317,712
	Diesel	58,994,453	VMT	98,384
	Aviation			
	Rail Transportation			
	Public Transit			
	Water Transportation			
	Off-Road			6,484
	Transportation and Mobile Sources Total:			**422,580**
Solid Waste	Waste Generation	73,078	Tons	42,420
	Composting	37,702	Tons	2,625
	Combustion of Solid Waste		Tons	
	Solid Waste Total:			**45,045**
Water & Wastewater	Septic Systems	93,859	Service Population	11,404
	Combustion of Digester Gas			
	Combustion of Biosolids and Sludges			
	N_2O Emissions			30
	Water & Wastewater Total:			**11,434**
Process & Fugitive Emissions	Natural Gas Distribution	3,652,561	Service Population	7,368
	Gas and Oil Wells			134,546
	Other Process and Fugitive			
	Process & Fugitive Emissions Total:			**141,914**
HFCs (refrigerants)				46,345
Agriculture				66,863
Forests and Trees	Removals from Forests			-296,193
	Removals from Trees Outside of Forests			-64,825
	Forests & Trees Total:			**-361,018**
	Total Gross Emissions:			**1,415,847**
	Total Emissions with Sequestration:			**1,054,829**

Table 16. 2018 Lake County Emissions Inventory

2018 Lake County GHGI

Sector	Fuel Or Source	2018 Usage	Usage Unit	2018 Emissions
Residential Energy	Electricity	906,150,299	kWh	506,729
	Natural Gas	8,162,926	MMBtu	434,157
	Propane	85,581	MMBtu	5,311
	Fuel Oil	102,668	MMBtu	7,644
	Res Energy Total:			**953,842**
Commercial Energy	Electricity	967,757,939	kWh	539,165
	Natural Gas	3,271,702	MMBtu	174,010
	Commercial Energy Total:			**713,175**
Industrial Energy	Electricity	577,753,228	kWh	319,314
	Natural Gas	299,575	MMBtu	15,900
	Non-Utility Fuels			84,850
	Industrial Energy Total:			**420,064**
Transportation & Mobile Sources	Gasoline	1,775,729,312	VMT	727,972
	Diesel	133,451,715	VMT	231,624
	Aviation			6
	Rail Transportation			
	Public Transit			
	Water Transportation			33,795
	Off-Road			14,002
	Transportation and Mobile Sources Total:			**1,007,399**
Solid Waste	Waste Generation	238,705	Tons	138,561
	Composting	38,372	Tons	2,672
	Combustion of Solid Waste		Tons	
	Solid Waste Total:			**141,233**
Water & Wastewater	Septic Systems	119,913	Service Population	14,569
	Combustion of Digester Gas	55,567	Service Population	3
	Combustion of Biosolids and Sludges			
	N_2O Emissions			826
	Water & Wastewater Total:			**15,398**
Process & Fugitive Emissions	Natural Gas Distribution	11,734,203	Service Population	23,671
	Gas and Oil Wells			65,436
	Other Process and Fugitive			230,384
	Process & Fugitive Emissions Total:			**319,491**
HFCs (refrigerants)				113,001
Agriculture				12,545
Forests and Trees	Removals from Forests			-98,228
	Removals from Trees Outside of Forests			-67,224
	Forests & Trees Total:			**-165,452**
	Total Gross Emissions:			**3,696,148**
	Total Emissions with Sequestration:			**3,530,696**

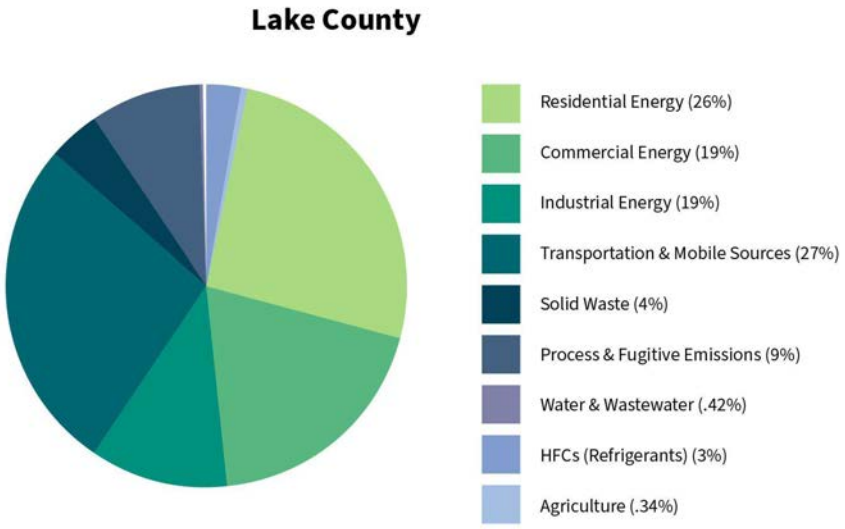


Figure 19. 2018 Lake County Emissions by Sector

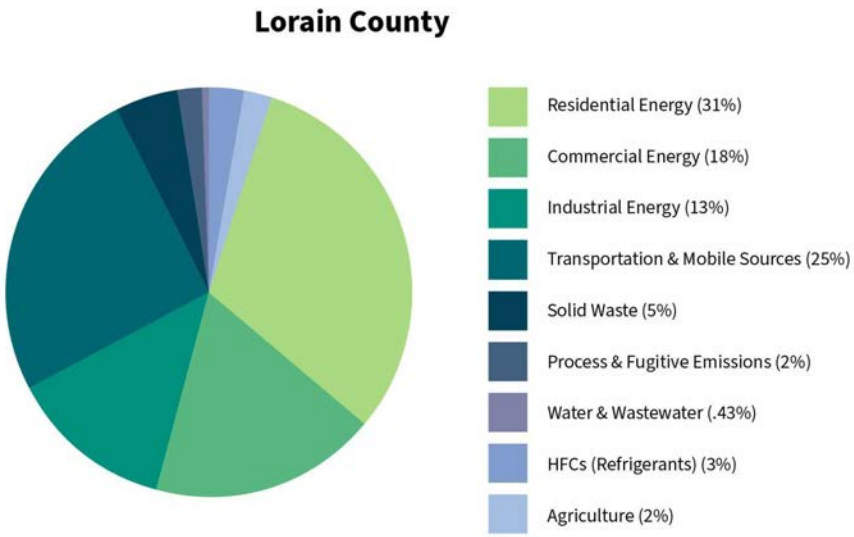


Figure 20. 2018 Lorain County Emissions by Sector

Table 17. 2018 Lorain County Emissions Inventory

2018 Lorain County GHGI

Sector	Fuel Or Source	2018 Usage	Usage Unit	2018 Emissions
Residential Energy	Electricity	1,173,965,126	kWh	566,728
	Natural Gas	18,917,550	MMBtu	1,006,158
	Propane	275,145	MMBtu	17,075
	Fuel Oil	74,104	MMBtu	5,518
	Res Energy Total:			**1,595,479**
Commercial Energy	Electricity	855,797,279	kWh	391,673
	Natural Gas	9,706,744	MMBtu	516,268
	Commercial Energy Total:			**907,941**
Industrial Energy	Electricity	704,467,502	kWh	313,334
	Natural Gas	7,009,932	MMBtu	372,049
	Non-Utility Fuels			4,393
	Industrial Energy Total:			**689,776**
Transportation & Mobile Sources	Gasoline	2,367,586,799	VMT	973,673
	Diesel	177,931,690	VMT	309,532
	Aviation			6
	Rail Transportation			187
	Public Transit			
	Water Transportation			12,760
	Off-Road			17,242
	Transportation and Mobile Sources Total:			**1,313,400**
Solid Waste	Waste Generation	409,699	Tons	237,818
	Composting	33,902	Tons	2,361
	Combustion of Solid Waste	890	Tons	308
	Solid Waste Total:			**240,487**
Water & Wastewater	Septic Systems	171,461	Service Population	20,832
	Combustion of Digester Gas	113,844	Service Population	7
	Combustion of Biosolids and Sludges			
	N_2O Emissions			1,141
	Water & Wastewater Total:			**21,980**
Process & Fugitive Emissions	Natural Gas Distribution	35,634,226	Service Population	61,824
	Gas and Oil Wells			62,566
	Other Process and Fugitive			
	Process & Fugitive Emissions Total:			**124,390**
HFCs (refrigerants)				152,041
Agriculture				120,114
Forests and Trees	Removals from Forests			-177,161
	Removals from Trees Outside of Forests			-29,712
	Forests & Trees Total:			**-206,873**
	Total Gross Emissions:			**5,165,607**
	Total Emissions with Sequestration			**4,958,734**

Table 18. 2018 Medina County Emissions Inventory

2018 Medina County GHGI

Sector	Fuel Or Source	2018 Usage	Usage Unit	2018 Emissions
Residential Energy	Electricity	773,478,214	kWh	369,176
	Natural Gas	9,526,565	MMBtu	506,685
	Propane	221,121	MMBtu	13,723
	Fuel Oil	133,746	MMBtu	9,958
	Res Energy Total:			**899,541**
Commercial Energy	Electricity	436,558,975	kWh	201,894
	Natural Gas	5,315,750	MMBtu	282,726
	Commercial Energy Total::			**484,620**
Industrial Energy	Electricity	451,505,985	kWh	246,221
	Natural Gas	1,731,849	MMBtu	91,917
	Non-Utility Fuels			
	Industrial Energy Total:			**338,138**
Transportation & Mobile Sources	Gasoline	1,848,336,004	VMT	749,651
	Diesel	138,908,339	VMT	241,452
	Aviation			
	Rail Transportation			
	Public Transit			
	Water Transportation			
	Off-Road			9,366
	Transportation and Mobile Sources Total:			**1,000,469**
Solid Waste	Waste Generation	219,936	Tons	127,666
	Composting	9,857	Tons	686
	Combustion of Solid Waste		Tons	
	Solid Waste Total:			**128,352**
Water & Wastewater	wastewater energy*	25,000	Service Population	94
	Fugitive Emissions	109,535	Service Population	13,308
	Combustion of Digester Gas			
	Combustion of Biosolids and Sludges			
	N_2O Emissions			107
	Water & Wastewater Total:			**13,415**
Process & Fugitive Emissions	Natural Gas Distribution	16,574,163	Service Population	29,214
	Gas and Oil Wells			181,958
	Other Process and Fugitive			
	Process & Fugitive Emissions Total:			**211,172**
HFCs (refrigerants)				88,646
Agriculture				94,890
Forests and Trees	Removals from Forests			-182,085
	Removals from Trees Outside of Forests			-20,177
	Forests & Trees Total:			**-202,262**
	Total Gross Emissions			**3,259,244**
	Total Emissions with Sequestration:			**3,056,982**

*wastewater energy is information only and is not included in sector/inventory totals, because it is already included in commercial or industrial energy use.

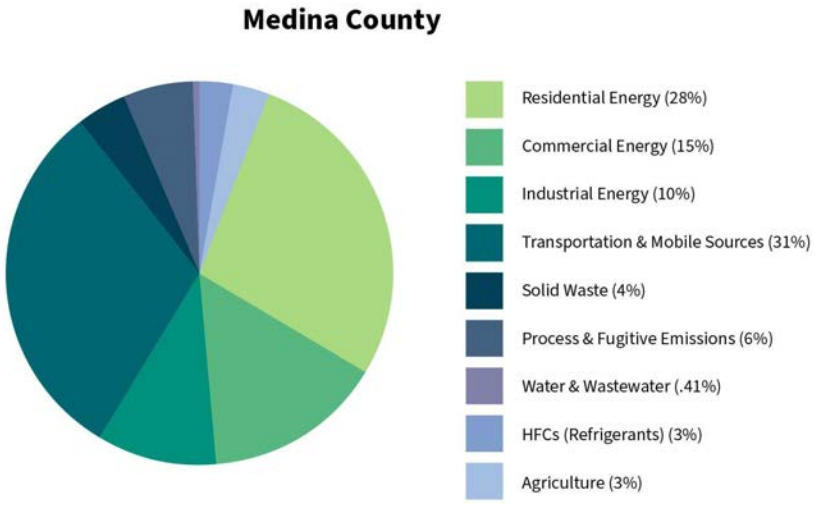


Figure 21. 2018 Medina County Emissions by Sector

Next Steps

The inventory should help focus and prioritize actions to reduce emissions (see GHG Reduction Measures section below). Completion of another GHG inventory in two to five years is recommended to assess progress resulting from any implemented actions; this will be part of the Comprehensive Climate Action Plan (CCAP). The detailed methodology, as well as notes and data files in the ClearPath tool and a master data Excel file provided to NOACA, will be helpful to complete a future inventory consistent with this one.

3.2 GHG Emissions Projections

NOACA contracted with ICLEI USA to forecast BAU community and government operations GHG emissions for the Cleveland-Elyria MSA and present one reduction scenario for regional emissions. ICLEI USA projected region-wide emissions based on the following assumptions:

- **Projected Population Growth** - Unlike most regions in the United States, the NOACA region has not shown population growth in recent decades. The regional population is expected to remain constant through 2050.
- **Projected VMT growth** - NOACA modeled and provided ICLEI USA with projections of annual VMT growth (0.33%)
- **National Renewable Energy Laboratory (NREL) electricity emissions intensity projections** - For the BAU projection, ICLEI USA forecast electricity emissions intensity

with NREL's Cambium model.[34] The mid-case for the model projects electricity intensity will decrease by 0.3% annually through 2030. Although electricity is likely to continue to become cleaner from 2030 to 2050, projections are less certain. Therefore, ICLEI USA assumes no additional change in electricity intensity from 2030 to 2050.

- **On-Road Transportation Fuel Efficiency Standards[35] (changes in passenger cars, light truck, medium, and heavy-duty truck[36] fuel economy are expected because of Corporate Average Fuel Economy (CAFE) standards)** - Fuel efficiency standards help project the reduction of emissions intensity for each mile driven by gasoline on-road vehicles. Fuel efficiency standards decrease emissions due to federally mandated improvements in vehicle fuel economy. ICLEI USA developed variables from fuel efficiency projections provided by the Center for Climate and Energy Solutions (C2ES).[37]
- **Refrigerants** - Federal regulations[38] require 85% reduction in consumption and production of HFCs by 2036. For 2030, BAU emissions continue due to leakage from existing equipment. Therefore, ICLEI USA assumes the regulation will have minimal impact on 2030 emissions. By 2050 all this equipment will have been replaced with equipment that uses alternative refrigerants. Therefore, ICLEI USA models an 85% reduction in BAU refrigerant emissions between 2030 and 2050.

ICLEI USA estimates the Cleveland-Elyria MSA's 2018 emissions at 37.12 million Metric Tons Carbon Dioxide Equivalent (million MT CO_2e). Note that this is total emissions produced and does not account for carbon removal by forests and trees outside of forests. Based on the above growth rates and emissions intensity factors, ICLEI USA projects the MSA's 2030 emissions will be 35.75 million MT CO_2e, and 2050 emissions will be 33.69 million MT CO_2e. Table 19 displays 2018 baseline and projected emissions for 2030 and 2050.

[34] National Renewable Energy Laboratory (NREL). Cambium (retrieved 2.14.2024 from https://www.nrel.gov/analysis/cambium.html).
[35] ClearPath Reference Sheet - Default Carbon Intensity Factors: https://docs.google.com/document/d/1WwVVIpNBxY8vkbN1zVqv5J2JOtYld4CV/edit?usp=sharing&ouid=114957718777074117870&rtpof=true&sd=true.
[36] Although CAFE standards apply to medium/heavy-duty trucks, the provided Carbon Intensity Factors are based on passenger cars and light-duty trucks because there has been limited analysis of the fleetwide impact.
[37] Center for Climate and Energy Solutions (C2ES). Federal vehicle standards (retrieved 2.9.2024 from https://www.c2es.org/content/regulating-transportation-sector-carbon-emissions/).
[38] United States Environmental Protection Agency. July 2023. Final Rule – Phasedown of Hydrofluorocarbons: Allowance Allocation Methodology for 2024 and Later Years (retrieved 2.15.2024 from https://www.epa.gov/system/files/documents/2023-07/SAN-8838-Final-Rule_Fact-Shee_508.pdf).

Table 19. Overview of Regional 2018 Baseline and 2030 and 2050 Projected Emissions (million MT CO_2e).

Sector	2018 Baseline	2030 Business-as-Usual	2050 Business-as-Usual
Residential Energy	9.21	9.08	9.08
Commercial Energy	6.86	6.72	6.72
Industrial Energy	7.00	6.86	6.86
Transportation & Mobile Sources	9.11	8.16	6.96
Process and Fugitive	2.06	2.06	2.06
Solid Waste	1.44	1.44	1.44
Water & Wastewater	0.12	0.12	0.12
Refrigerants (HFCs)	1.01	1.01	0.15
Agriculture	0.30	0.30	0.30
Total Emissions Produced	**37.12**	**35.75**	**33.69**
Forest and Trees	-1.17	-1.17	-1.17

Figure 22 presents emissions reduction measures identified through discussion between regional stakeholders, NOACA staff, and ICLEI USA; and modeled by ICLEI USA. The overall result from these actions is a 49% reduction from the 2018 baseline in 2030, and a 90% reduction in 2050.

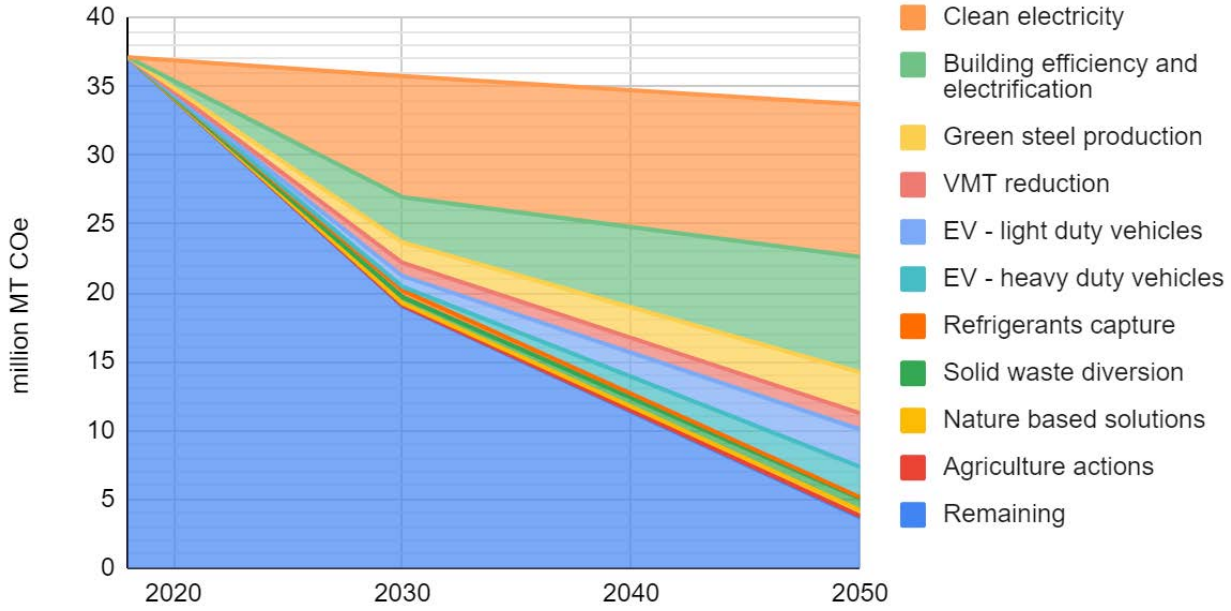


Figure 22. Emission Reduction Wedge for Priority Measures (through 2050)

Table 20 presents the expected emissions reduction from each measure in 2030 and 2050, as well as the relative level of impact in each of those years. Table 21 shows the definitions used to classify the level of impact. More information about each measure, including the modeling data, follows Table 21. The reductions shown in Table 20 represent the difference between emissions in that year (2030 or 2050) based on the implemented measure, and emissions without implementation (BAU). ICLEI USA accounts for interactions between measures following the order of the measures in the table (that is, measures that appear higher on the table are assumed to have also been implemented). An example of such an interaction is between the building efficiency and electrification measure and the clean electricity measure. The building efficiency and electrification measure results in a decrease in natural gas use, but a net increase in electricity use. ICLEI USA calculates the emissions reduction with emissions factors based on clean electricity measure implementation. A similar interaction occurs between clean electricity and light/heavy duty vehicle electrification measures.

Table 20. Strategies with Net Reduction (million MT CO2e) and Level of Impact (2030 and 2050)

Measure	Million MTCO2e reduced in 2030	2030 Level of Impact	Million MTCO2e reduced in 2050	2050 Level of Impact
Clean electricity	8.80	Very high	11.08	Very high
Building efficiency and electrification	3.28	High	8.39	Very high
Green steel production	1.49	Medium high	2.97	High
VMT reduction	0.96	Medium high	1.18	Medium high
EV - light duty vehicles	0.77	Medium high	2.71	High
EV - heavy duty vehicles	0.26	Medium low	2.22	High
Refrigerants capture	0.51	Medium low	0.08	Low
Solid waste diversion	0.43	Medium low	0.85	Medium high
Nature based solutions	0.15	Low	0.42	Medium low
Agriculture actions	0.06	Low	0.12	Low

Table 21. Level of Impact Definitions

	Reduction range (MT CO2e)	Approx % of 2018 regional emissions
Very high	Greater than 3.5 million	Greater than 10%
High	1.75 million to 3.5 million	5% to 10%
Medium high	0.7 million to 1.75 million	2% to 5%
Medium low	0.35 to 0.7 million	1% to 2%
Low	Less than 0.35 million	Less than 1%

3.3 Greenhouse Gas Reduction Measures

Description of Potential Actions	• Support current local municipal electric utilities development of clean energy • Virtual power plant; community choice aggregation; grid responsive demand management; microgrid development; and electricity storage • Decarbonize the grid • Build regional consortium of researchers and manufacturers to pursue federal grants like the recent hydrogen hubs • Partner with school districts to increase rooftop solar availability- coordinated procurement (bulk) • Develop community and large scale solar projects on public buildings/property • Solarize campaign where homeowners across community or

	region receive group solar purchase price from prescreened contractors • Regional clean cities coalition that advocates for streamlining renewable projects, permitting, and stabilizing capacity markets
GHG Emissions Reduction Projection Assumptions	Nationally, emissions from the electric power generation sector have already decreased since 2005, and electric generation is the most significant near-term opportunity for emissions reduction by 2030. Rapid cost decreases in solar and wind generation and battery storage, combined with Federal incentives contained in the IRA provide the opportunity for rapid emissions reductions in this sector. ICLEI USA modeled an 80% reduction in emissions per kWh from 2018 to 2030, and 99.99% reduction from 2018 to 2050 (averaged across utilities serving the region). This is in line with targets that have been adopted by many utilities across the country (see examples below); some have set goals to reach zero emissions sooner than 2050. 1. Xcel Energy - 80% emissions reduction in 2030, zero emissions in 2050 2. CenterPoint Energy - Net zero emissions by 2035 3. Austin Energy - 100% carbon free generation by 2035
2030 Projection (million MT CO_2e)	8.80 (very high impact)
2050 Projection (million MT CO_2e)	11.08 (very high impact)
Implementing Agency or Agencies	Municipal housing authorities
	Municipal/county governments
	Municipal/public electric utilities (e.g., Cleveland Public Power, Cuyahoga Green Energy, Oberlin Municipal Light and Power System, Painesville Municipal Electric)

	Public electric aggregators (e.g., Northeast Ohio Public Energy Council, Sustainable Ohio Public Energy Council)
	Renewable energy companies/installers
	Rural electric cooperatives (e.g., Firelands Electric Coop, Lorain-Medina Rural Electric Coop)
	School districts
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it
Implementation Schedule (Milestones)	
Painesville Municipal Electric Solar Program	2025 – Project design
	2026 – Installation & interconnection (assuming CPRG funding)
Cuyahoga County landfill solar program	2025 – Project design
	2026/27 – Installation and interconnection (assuming CPRG funding)
City of Cleveland renewable energy installations	Crown Water Treatment, Green Road Pump Station, and Parma Pump Station (will run in tandem)
	April 2024: Project finalized designs and approvals

	July 2024: Project construction
	August 2024: Project commissioning and completion
	Gunning Recreation Center:
	April 2024: Project finalized design and approvals
	September 2024: Project construction
	October 2024: Project commissioning and completion
Euclid Microgrid Project	2024/25 – Project design
	2025/26 – Project construction
	2027 – Project completion and interconnection
Airport Microgrid Project	2024/25 – Project design
	2025/26 – Project construction
	2027 – Project completion and interconnection
County Jail Microgrid Project	2024/25 – Project design

	2025/26 – Project construction
	2027 – Project completion and interconnection
Solar for Schools Program	2024 – Project design, construction & interconnection
Residential Solar Co-op Program	ongoing
Geographic Location	Clean electricity projects can take place throughout the Cleveland-Elyria MSA, though specific projects will occur in locations included, but not limited to:
	Broadview Heights
	Brooklyn
	City of Euclid
	Cleveland
	Garfield Heights
	Painesville
Solar for Schools:	Cleveland, Euclid, East Cleveland, Maple Heights, Cuyahoga Heights

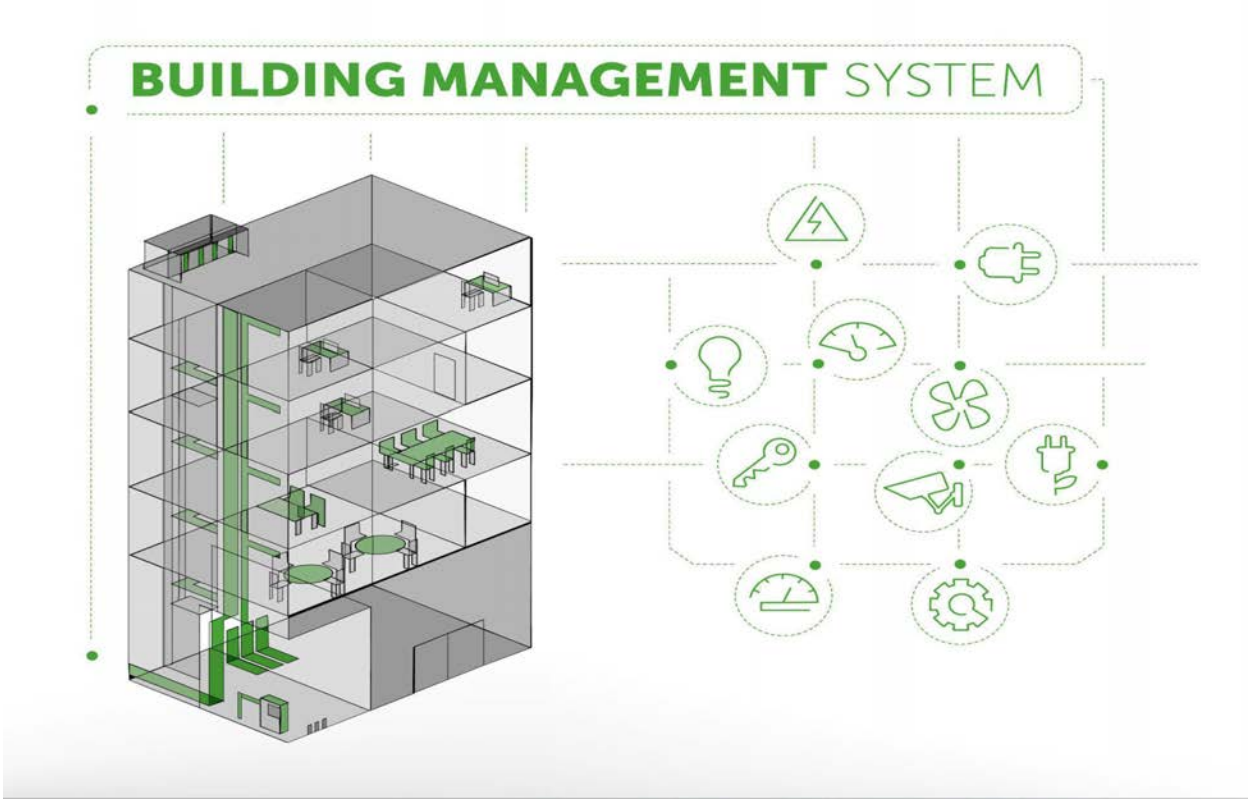
Solar Co-op:	Cuyahoga County
Funding Sources	Congressionally Directed Spending
	CPRG Implementation Grants
	Greenhouse Gas Reduction Fund/Solar for All
	Grid Resilience and Innovation Partnerships Program
	Inflation Reduction Act Investment Tax Credits
	Inflation Reduction Act Production Tax Credits
Metrics to Track Progress	kWh capacity of clean energy generation installed
	Number of buildings/houses with renewable energy installations
	Number of workforce development programs created clean energy; number of workers trained through these programs
	Share of households covered by electric aggregation programs with 100% clean energy
	Share of electricity in Cleveland-Elyria MSA from zero carbon sources

Feasibility (cost, political will, technical capacity, etc.)

HIGH MEDIUM LOW

Building Efficiency and Electrification

Sectors:



Description of Potential Actions	Financial incentives and novel financing approaches to promote more adoption of renewals and energy efficiency/conservation • Incentivize energy conservation measures in public buildings and the use of ENVISION rating system to verify new or renovated public infrastructure • Benchmarking policy that requires larger buildings to report energy use (energy tune-up requirements for low performing buildings). • Increase home weatherization programs • Electrify the heating sector through heat pumps, geo-thermal, networked geo-thermal and other means to reduce natural gas devices

	and emissions (renewable natural gas only when necessary); identify opportunities and develop pilots for district/ neighborhood scale geothermal heat networks • Advocate for the state to update building code • Install building envelope and electrification upgrade package (include electrical system upgrades) for low and moderate income residents (stack incentives for low/no cost). • Workforce development/contractor training for energy efficiency and building electrification opportunities; educational clearinghouse/website for homeowners to easily identify efficiency incentives and contractors
GHG Emissions Reduction Projection Assumptions	Building electrification and efficiency takes more time to implement than clean electricity. A principle limiting factor is the lifetime of existing heating equipment (typically 15 to 20 years). Based on this, ICLEI USA modeled 5% (1/20) of existing buildings per year (starting in 2023) to have heating electrified, and an additional 5% per year to receive an efficiency retrofit that produces a 20% reduction in heating energy demand (i.e., natural gas savings). This continues until 100% of buildings have been retrofitted and electrified by 2042 (20th year after the start of implementation). Based on this gradual process, the emissions reduction in 2050 is more than twice the reduction in 2030 (2030 being less than halfway through the time needed to reach all buildings).
2030 Projection (million MT CO_2e)	3.28 (high impact)
2050 Projection (million MT CO_2e)	8.39 (very high impact)
Implementing Agency or Agencies	Energy efficiency companies/installers
	Investor-Owned Utilities (e.g., Columbia Gas, Dominion East Ohio Gas)
	Municipal housing authorities
	Municipal/county governments

	Municipal/public electric utilities (e.g., Cleveland Public Power, Cuyahoga Green Energy, Oberlin Municipal Light and Power System, Painesville Municipal Electric)
	Public electric aggregators (e.g., Northeast Ohio Public Energy Council, Sustainable Ohio Public Energy Council)
	Rural electric cooperatives (e.g., Firelands Electric Coop, Lorain-Medina Rural Electric Coop)
	School districts, colleges, and universities
	Trade unions
	Workforce development and business organizations (e.g., Greater Cleveland Partnership, MAGNET, Ohio Means Jobs)
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement most actions associated with it, with a few exceptions:
	Secure state approval for updated building code
	Pass local ordinances authorizing building performance standards, where appropriate
Implementation Schedule (Milestones)	June 2024: Begin project planning
	January 2025: Project planning complete; begin project implementation
	June 2029: 25% buildings received heat electrification & energy retrofit

	December 2033: 50% buildings received heat electrification & energy retrofit
	June 2038: 75% buildings received heat electrification & energy retrofit
	December 2042: Project implementation 100% complete, project close-out report
Geographic Location	Energy efficiency and electrification projects can take place throughout the Cleveland-Elyria MSA, though specific projects will occur in locations included, but not limited to:
	Cleveland
	Cuyahoga County
	Oberlin
	Painesville
Funding Sources	Energy Auditor Training Grant Program
	Energy Efficiency and Community Block Grant Program
	Energy Efficiency Home Improvement Credit
	Energy Efficient Commercial Buildings Deduction
	Green and Resilient Retrofit Program - Grants and Loans
	High-Efficiency Electric Home Rebate Program
	Home Energy Performance-Based, Whole-House Rebates

	Home Weatherization Assistance Program
	New Energy Efficient Homes Credit
	State-Based Home Efficiency Contractor Training Grants
	Utility Rebate Programs
Metrics to Track Progress	Heat pumps share of commercial and residential heating system sales
	Number of buildings/houses receiving energy efficiency improvements
	Number of commercial and residential energy audits conducted
	Number of commercial and residential heat pump installations
	Number of public sector buildings receiving energy efficiency improvements
	Number of workforce development programs created for energy efficiency/electrification; number of workers trained through these programs
Feasibility (cost, political will, technical capacity, etc.) HIGH MEDIUM LOW	

Green Steel Production

Sectors:

Description of Potential Actions	Expand participation in the US Department of Energy's better plants program (which identifies opportunities for industrial energy efficiency) • Use of green hydrogen, electric arc furnaces, or new technologies using clean electricity • Implement technologies to reduce emissions in the production process
GHG Emissions Reduction Projection Assumptions	50% of steel production in the region is converted to use zero carbon energy inputs (also reducing steel production process emissions by 50%) in 2030. This could be through use of green hydrogen, electric arc furnaces, or new technologies using clean electricity. This increases to 100% in 2050.

2030 Projection (million MT CO_2e)	1.49 (medium high impact)
2050 Projection (million MT CO_2e)	2.97 (high impact)
Implementing Agency or Agencies	Steel producers (e.g., Cleveland Cliffs, US Steel) Trade unions Workforce development and business organizations (e.g., Greater Cleveland Partnership, MAGNET, Ohio Means Jobs)
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it Municipal/county governments can support implementation by acting as a convener for different parties and stakeholders and provide support to secure funding
Implementation Schedule (Milestones)	Example Project Schedule: January 2025: Begin project planning phase January 2026: Project planning complete January 2027: Project implementation 10% complete January 2028: Project implementation 25% complete June 2028: Check in on project progress/develop progress report update

	January 2029: Project implementation 60% complete
	January 2030: Project implementation 100% complete, project close-out report
Geographic Location	Communities with steel production facilities: Cleveland and Lorain
Funding Sources	Advanced Industrial Facilities Deployment Program
	Advanced Manufacturing Production Credit
	Clean Hydrogen Manufacturing Recycling Research, Development, and Demonstration Program
	Clean Hydrogen Production Tax Credit
	Industrial Emission Demonstration Projects
	Industrial Research and Assessment Center Implementation Grants
	Regional Clean Hydrogen Hubs
Metrics to Track Progress	Carbon intensity of steel production in region
	Share of zero-carbon energy used in steel production
	Share of steel production involving direct reduced iron (DRI)

Feasibility (cost, political will, technical capacity, etc.)

HIGH MEDIUM LOW

Vehicle Miles Traveled Reduction

Sectors:

Description of Potential Actions	Incentivize smart land use patterns that create transit-oriented developments (TODs) around transit hubs, with integration between transit providers and first/last mile modes (bikeshare, scooters, electric car share) • Include multimodal transportation infrastructure and Complete Streets • Encourage smart land use to minimize commute distances (saving time, money, and emissions)
GHG Emissions Reduction Projection Assumptions	VMT is reduced 15% in 2030 and 30% in 2050. 15% VMT reduction is the goal recommended by the transportation technical working group convened by NOACA. Because land use planning actions take time to make changes in the physical environment, but have significant impact on VMT,

	ICLEI USA expects the VMT reduction potential in 2050 to be quite a bit larger than in 2030; thus they doubled the expected VMT reduction to 30% in 2050. However, since vehicles are expected to become more efficient over time in the business-as-usual case, because of Federal CAFE standards, the emissions impact does not double - more efficient vehicles make the emissions impact of avoiding a vehicle mile less in 2050 than in 2030.
2030 Projection (million MT CO_2e)	0.96 (medium high impact)
2050 Projection (million MT CO_2e)	1.18 (medium high impact)
Implementing Agency or Agencies	Municipal/county governments
	NOACA
	Private businesses (e.g., bike shops, healthcare organizations, large employers)
	Transit Authorities (e.g., Greater Cleveland Regional Transit Authority, Laketran)
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it
	Municipalities may pass legislation to support implementation of this measure, including but not limited to:
	Complete and Green Streets Ordinances
	Parking minimum standards revisions/repeals
	Transportation demand management/trip reduction ordinances
	Zoning code revisions

Implementation Schedule (Milestones)	Northeast Ohio Regional E-Bike Rebate Program:
	January 2025: Launch program design
	July 2025: Open program to public
	December 2028: E-Bike rebates expended
Geographic Location	Communities throughout the Cleveland-Elyria MSA will implement this action
Funding Sources	Community Change Grant
	CPRG Implementation Grants
	Neighborhood Access and Equity Grant Program
	Pilot Program for Transit Oriented Development
	Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Program
	Reconnecting Communities Pilot Program
	Safe Streets and Roads for All
	Strengthening Mobility and Revolutionizing Transportation (SMART) Grants
Metrics to Track Progress	Number of Complete Streets projects completed
	Number of E-Bikes purchased in Northeast Ohio
	Number of miles of bike lanes/protected bike lanes/multimodal paths added in the region

Share of new housing units built in Transit-Oriented Development (TOD) areas

Single occupancy vehicle (SOV) travel mode share

Travel mode shares for active transportation, public transit

Feasibility (cost, political will, technical capacity, etc.)

HIGH MEDIUM LOW

Light Duty Vehicle Electrification

Sectors:

Description of Potential Actions	Electrify region's municipal and local government fleets • Educate residents and dealers about the benefits of electric vehicles and available Inflation Reduction Act tax incentives • Create robust, reliable public electric vehicle charging network with an emphasis on areas with a high volume of multi-family housing
GHG Emissions Reduction Projection Assumptions	Like building equipment, vehicles take time to turn over and be replaced. In addition, EV sales, while growing rapidly, were only 7.6% of light duty vehicle sales in the US in 2023. These two factors mean emissions reductions in 2050 are significantly larger than those that can be achieved by 2030. 18% of on-road gasoline vehicles are electric by 2030. Local action to promote this would be consumer education and charging infrastructure, including charging for multifamily buildings. 18% is based on projection of expected national EV adoption rates; sales growth projected by Rocky Mountain Institute is combined with a vehicle lifetime of 16.2 years. These projections lead to 99% of light duty vehicles being electric in 2050.

2030 Projection (million MT CO_2e)	0.77 (medium high impact)
2050 Projection (million MT CO_2e)	2.71 (high impact)
Implementing Agency or Agencies	Municipal/county governments
	NOACA
	Public electric aggregators (e.g., Northeast Ohio Public Energy Council, Sustainable Ohio Public Energy Council)
	Vehicle retailers (e.g., car dealerships)
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it
Implementation Schedule (Milestones)	NOACA's Electric Vehicle Charging Station Program:
	2023: Phase I of the installation step begins. Phase I features installation of 76 chargers in 40 sites throughout the NOACA region. Phase I includes 57 L2 and 19 DCFC chargers
	2024: Phase I installation continues
	2025: Phase I installation complete
	2026: Phase II of the installation step begins. Phase II features installation of 252 chargers in approximately 70 sites throughout the NOACA region. Phase II includes 108 L2 and 144 DCFC chargers.

	2027: Phase II installation complete
Geographic Location	Communities throughout the Cleveland-Elyria MSA will implement this action
Funding Sources	Charging and Fueling Infrastructure Grant Program
	Clean School Bus Program
	Community Change Grant
	Congestion Mitigation and Air Quality (CMAQ) Program
	Electric Vehicle (EV) and Fuel Cell Electric Vehicle (FCEV) Tax Credit
	National Electric Vehicle Infrastructure (NEVI) Program
	NOACA EV Charging Infrastructure Program
Metrics to Track Progress	EV share of public sector fleets
	EVs as share of regional light-duty vehicle sales
	Number of EV charging stations installed
	Number of EVs added to public sector fleets

Feasibility (cost, political will, technical capacity, etc.)

HIGH MEDIUM LOW

Heavy Duty Vehicle Electrification

Sectors:

Description of Potential Actions	Electrify region's school buses, public transit vehicles and other heavy-duty vehicles & equipment
GHG Emissions Reduction Projection Assumptions	Like building equipment, vehicles take time to turn over and be replaced. In addition, EV sales, while growing rapidly, were only 7.6% of light duty vehicle sales in the US in 2023. These two factors mean emissions reductions in 2050 are significantly larger than those that can be achieved by 2030. 15% of on-road diesel vehicles are electric by 2030. While heavy duty vehicles have been slower to electrify than light duty vehicles, the fleet turns over more quickly, so they are expected to quickly begin catching up. These projections lead to 99% of heavy-duty vehicles being electric in 2050.
2030 Projection (million MT CO_2e)	0.26 (medium low impact)

2050 Projection (million MT CO_2e)	2.22 (high impact)
Implementing Agency or Agencies	Municipal/county governments
	NOACA
	Private vehicle fleet operators (e.g., delivery companies, truck freight operators)
	Public electric aggregators (e.g., Northeast Ohio Public Energy Council, Sustainable Ohio Public Energy Council)
	School districts
	Transit Authorities (e.g., Greater Cleveland Regional Transit Authority, Laketran)
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it
Implementation Schedule (Milestones)	NOACA's Electric Vehicle Charging Station Program:
	2023: Phase I of the installation step begins. Phase I features installation of 76 chargers in 40 sites throughout the NOACA region. Phase I includes 57 L2 and 19 DCFC chargers
	2024: Phase I installation continues (estimated 50% complete)
	2025: Phase I installation complete
	2026: Phase II of the installation step begins. Phase II features installation of 252 chargers in approximately 70 sites throughout the NOACA region. Phase II includes 108 L2 and 144 DCFC chargers.

	2027: Phase II installation complete
	City of Euclid Electric School Bus Program:
	January 2024: Awarded funds from Clean School Bus Program
	Mid-2024: Finalize grant agreement
	Late 2024-2025: Procure (10) electric buses and related charging infrastructure
Geographic Location	Communities throughout the Cleveland-Elyria MSA will implement this measure
Funding Sources	Charging and Fueling Infrastructure Grant Program
	Clean School Bus Program
	Congestion Mitigation and Air Quality (CMAQ) Program
	Credit for Qualified Commercial Clean Vehicles
	National Electric Vehicle Infrastructure (NEVI) Program
	NOACA EV Charging Infrastructure Program
Metrics to Track Progress	EV share of public sector medium- and heavy-duty vehicles (MDHVs)
	EVs as share of regional MDHV sales
	Number of EV charging stations installed
	Number of EVs added to public sector MDHV fleets

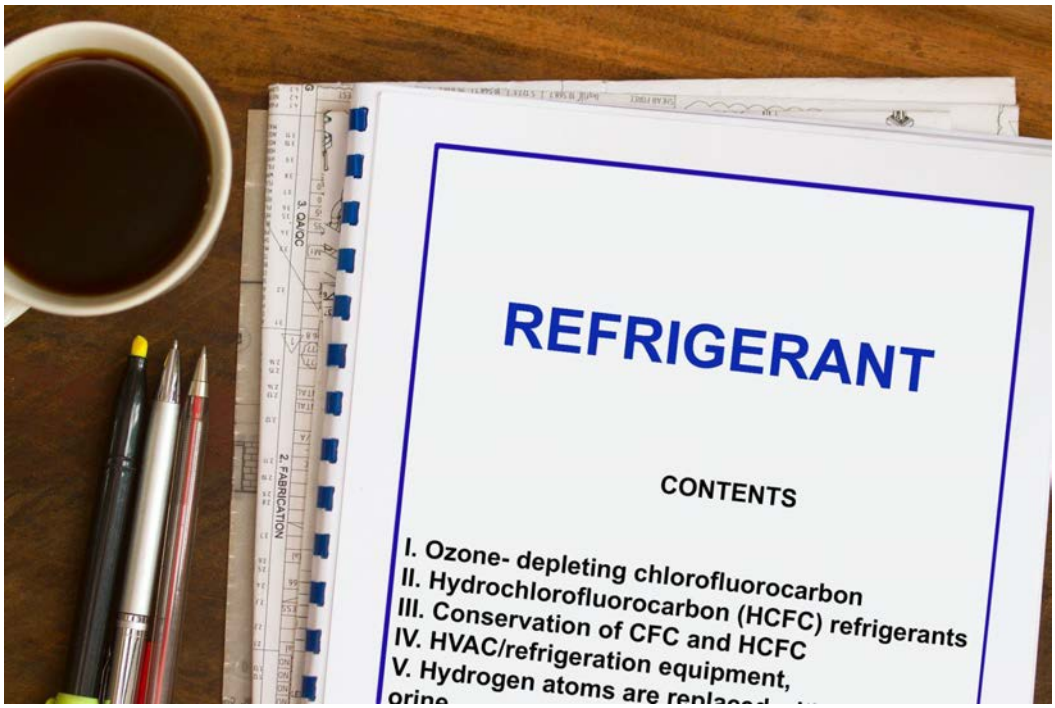
Share of EVs for school and transit bus fleets

Feasibility (cost, political will, technical capacity, etc.)

HIGH MEDIUM LOW

Refrigerants Capture

Sectors:



Description of Potential Actions	Build a system and conduct education to ensure refrigerants are captured at the end of equipment life • Work with heating, ventilation, and air conditioning (HVAC) contractors and provide consumer collection/drop-off for appliances.

GHG Emissions Reduction Projection Assumptions	Some commonly used refrigerants, specifically a class of chemicals called hydrofluorocarbons (HFCs), have a very high global warming potential - that means a pound of the refrigerant can have hundreds or thousands of times the warming impact of a pound of carbon dioxide. Federal regulations require an 85% reduction in consumption and production of HFCs by 2036 (these would be replaced with refrigerants that have a much lower global warming potential). While these regulations address emissions in the longer term, there is still a significant amount of refrigerants contained in existing equipment that can leak into the atmosphere if the equipment is not carefully serviced and discarded. The goal of the measure is to capture as much of these refrigerants in existing equipment as possible. ICLEI USA modeled 50% capture of leaking refrigerants (HFCs). Baseline refrigerant emissions are downscaled from the US national inventory based on population. For 2030, business as usual emissions continue from existing equipment leakage, but by 2050 all this equipment will have been replaced with equipment that uses alternative refrigerants. Therefore, the 2050 impact of the action is much less than in 2030.
2030 Projection (million MT CO_2e)	0.51 (medium low impact)
2050 Projection (million MT CO_2e)	0.08 (low impact)
Implementing Agency or Agencies	Municipal/county governments
	Private businesses (e.g. cold storage facilities, healthcare organizations, supermarkets)
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it
Implementation Schedule (Milestones)	June 2024: Begin project planning phase

	January 2025: Project planning complete; begin project implementation
	January 2028: Project implementation 20% complete
	January 2030: Project implementation 40% complete
	June 2032: Check in on project progress/develop progress report update
	January 2034: Project implementation 80% complete
	January 2036: Project implementation 100% complete, project close-out report
Geographic Location	Communities throughout the Cleveland-Elyria MSA will implement this action
Funding Sources	HFC Reclaim and Innovative Destruction Grants (EPA)
	Industrial Efficiency and Decarbonization Office Cross-Sector Technologies Funding (DOE)
	Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) Program (DOE)
Metrics to Track Progress	Number of facilities implementing refrigerants capture projects
	GHG savings from refrigerants capture
Feasibility (cost, political will, technical capacity, etc.) HIGH MEDIUM LOW	

Solid Waste Diversion

Sectors:

Description of Potential Actions	Divert organic waste (food waste and paper) from the landfill through education, establishment of community drop-off locations for food waste composting, commercial pick-up locations and curbside organics collection
GHG Emissions Reduction Projection Assumptions	Divert 30% of organic waste (food waste and paper) from the landfill in 2030 and 60% in 2050. The emissions reduction is proportional to the amount of waste diverted, so it also doubles. Since the inventory uses the methane commitment model, which assigns emissions to the year that waste is generated, this same approach is used for emissions reductions from the action. Local action to

	promote this could include education, establishment of drop-off locations for food waste composting, and/or curbside organics collection.
2030 Projection (million MT CO_2e)	0.43 (medium low impact)
2050 Projection (million MT CO_2e)	0.85 (medium high impact)
Implementing Agency or Agencies	Municipal/county governments
	Private waste haulers (e.g. Republic Services, Waste Management)
	Solid Waste Management Districts
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it
Implementation Schedule (Milestones)	City of Cleveland Residential Composting Program:
	Monthly: Complete National Organic Program (NOP)-compliant Training – Rustbelt Riders to train Rid-All and offer monthly support
	June 2024: Choose and implement first few compost drop-off sites
	July 2024: Begin public engagement campaign
	October 2024: Hire Compost Ambassadors
	November 2024: Complete Compost Ambassador Training

	TBD November 2024: Begin training Compost Trainees for Workforce Development
	July 2025: Distribute finished compost from food waste to Rid-All Farm and area community gardens, farms (estimated 100 cubic yards/annually)
	October 2025: Hire Year 2 Compost Ambassadors
	November 2025: Complete Compost Ambassador Training
Geographic Location	Communities throughout the Cleveland-Elyria MSA will implement this action, including but not limited to:
	Cleveland
	Cuyahoga County
Funding Sources	Composting and Food Waste Reduction Grants
	Ohio EPA Recycling and Litter Prevention Grants
	Reduce, Reuse, Recycling Education and Outreach Grants
	Solid Waste Infrastructure for Recycling Infrastructure Grants
Metrics to Track Progress	Number of community drop-off locations for composting
	Number of enrollees per site, including subsidized SNAP-eligible households
	Number of waste reduction education and outreach programs, number of people engaged by these programs
	Number of Compost Ambassadors, number of events they deploy

Number of Compost Trainees and number of hours

Cubic yards of compost processed from food waste

Cubic yards of compost free from Rid-All / re-sold by Rustbelt Riders

Tons of organic waste diverted from landfill

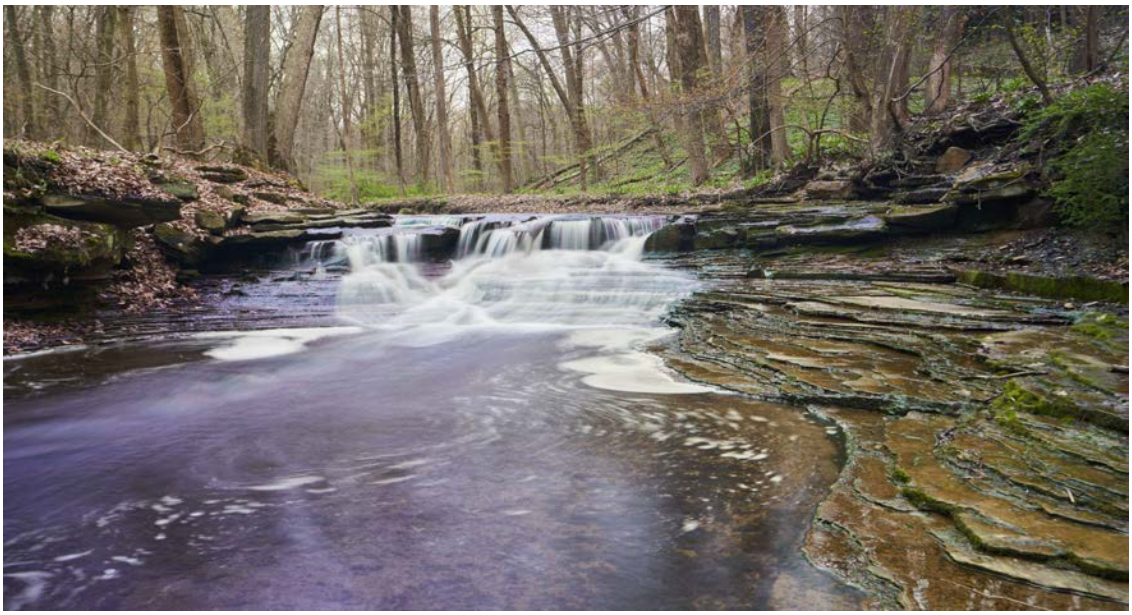
Share of residential solid waste being recycled

Feasibility (cost, political will, technical capacity, etc.)

HIGH MEDIUM LOW

Nature-Based Solutions

Sectors:



Description of Potential Actions	Protect and restore healthy, stable streams and water systems, including Lake Erie and river shorelines • Actively address existing and new forest pests (e.g. Spotted Lanternfly) and pathogens (e.g. Beech Leaf Disease) aggressively and at an early stage to eradicate or at least minimize damage to forests and trees. • Expand tree canopy, coordinate tree planting programs and disseminate knowledge (e.g. on suitable species) throughout the region • Manage public and private landscapes to provide communities with accessible recreation and support habitat, biodiversity, and ecosystem services, including adoption of managed landscape ordinances • Remove unutilized pavement and other impervious surfaces, de-compact soil and restore natural surfaces to support stormwater absorption • Support long-term protection and acquisition of large blocks of undeveloped land or parcels that strategically connect/link green spaces in the region •

	Provide education, resources, and incentives to help communities, businesses, and homeowners build detention basins, rain gardens, permeable pavements, native landscaping, and other stormwater management tools. • Expand green infrastructure grant programs throughout the region
GHG Emissions Reduction Projection Assumptions	ICLEI USA modeled increases to both forest area, and to tree canopy outside of forests, in urban, suburban and agricultural areas. For tree canopy outside of forests, ICLEI USA applied an annual increase of 2.94% of the baseline area. This is based on the projected tree planting needed to meet the goals of the Cleveland Tree Plan, with the same rate of increase extended to the region. ICLEI USA also applied an increase in parks and conservation land area from 7% of the region in 2010 to 15% in 2040, based on the Vibrant NEO 2040 “Do Things Differently” scenario. 50% of new parks and conservation land is assumed to be unforested land that becomes forested. ICLEI USA modeled both forest area and non-forest tree canopy increasing linearly from year to year, so the emission impact increases with the number of years; the 2050 impact is more than double the 2030 impact because of the longer time. For the increased forest area and tree outside of forests ICLEI USA applied carbon removal (sequestration) factors from the ICLEI Land Emissions and Removals Navigator (LEARN) tool; these are the same factors used in the inventory.
2030 Projection (million MT CO_2e)	0.15 (low impact)
2050 Projection (million MT CO_2e)	0.42 (medium low impact)
Implementing Agency or Agencies	Municipal/county governments
	Soil and Water Conservation Districts

	Wastewater management utilities (e.g., Northeast Ohio Regional Sewer District)
	Non-profit and advocacy organizations (e.g., Cleveland Tree Coalition, Holden Forests and Gardens)
	NOACA
	Parks Districts (e.g., Cleveland Metroparks, Lorain County Metro Parks)
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it
Implementation Schedule (Milestones)	Cuyahoga County Healthy Urban Tree Canopy Grant Program – ongoing
	City of Euclid Urban Tree Canopy Program
	March 2024:
	Finalize contract to complete tree inventory and assessment, and develop a tree canopy master plan with third-party consultant
	Finalize and advertise urban forester position
	May 2024: Hire and onboard urban forester
	June 2024-2025: Perform and complete tree inventory and assessment through third-party consultant
	2025: Develop tree canopy master plan with third-party consultant
Geographic Location	Communities throughout the Cleveland-Elyria MSA will implement this action, including but not limited to:

	Cleveland
	Cuyahoga County
Funding Sources	Assistance to Forest Landowners with <2,500 Acres of Forestland - Emerging Private Markets for Climate Mitigation and Forest Resilience
	Cleveland Tree Coalition Grants
	Conservation Innovation Grants
	Cuyahoga County Healthy Urban Tree Canopy Grant program
	H2Ohio Grants
	NEORSD Green Infrastructure Grant Program
	Payments to Private Forestland Landowners for Implementation of Forestry Practices
	Urban and Community Forestry Assistance Program
Metrics to Track Progress	Acres of land acquired/set aside for conservation
	Number of green infrastructure projects implemented
	Number/acres of trees planted
	Percent of population located within 10-minute walk of public park or green space
	Share of region covered by tree canopy

Square feet of impervious surfaces removed

Feasibility (cost, political will, technical capacity, etc.)

HIGH MEDIUM LOW

Agriculture Actions

Sectors:

Description of Potential Actions	Manure management actions to capture methane for energy • Conservation agriculture (uses cover crop, crop rotation, and minimal tilling to produce annual crops; protects soil, avoids emissions, and sequesters carbon)

GHG Emissions Reduction Projection Assumptions	Conservation agriculture: ICLEI USA modeled the use of crop rotation, cover crops, and reduced tilling of soil. These changed farming practices result in reduced soil emissions and increased sequestration of carbon in soil. ICLEI USA modeled the application of these practices to 35% of crop land in the region in 2030 and 70% in 2050. Factors for the emissions impact per acre come from Project Drawdown • Manure methane capture for energy: ICLEI USA modeled use of anaerobic digesters at farms with large numbers of animals (dairy, hog production, and poultry) to capture methane from manure, and to use it in place of fossil gas - either for energy use on site, or distribution to other users. ICLEI USA modeled installation of this equipment at farms to represent 35% of regional manure management emissions in 2030, and 70% in 2050.
2030 Projection (million MT CO_2e)	0.07 (low impact)
2050 Projection (million MT CO_2e)	0.13 (medium low impact)
Implementing Agency or Agencies	Municipal/county governments Soil and Water Conservation Districts Non-profit and advocacy organizations (e.g., Ohio Farm Bureau) Colleges and universities (e.g., Ohio State University Extensions) Parks Districts (e.g., Cleveland Metroparks, Lorain County Metro Parks)
Milestones to Obtain Implementing Authority	Entities enacting this measure have the authority to implement it
Implementation Schedule (Milestones)	January 2025: Begin project planning phase for regional conservation agriculture and manure management practices

	January 2026: Project planning complete; begin project implementation
	January 2030: Project implementation 35% complete
	January 2040: Project implementation 50% complete
	January 2050: Project implementation 70% complete
Geographic Location	Communities throughout the Cleveland-Elyria MSA will implement this action
Funding Sources	Agricultural Conservation Easement Program (ACEP)
	Assistance to Forest Landowners with <2,500 Acres of Forestland - Emerging Private Markets for Climate Mitigation and Forest Resilience
	Conservation Innovation Grants
	H2Ohio Grants
	Inflation Reduction Act Investment Tax Credit for Biogas Digesters
	Payments to Private Forestland Landowners for Implementation of Forestry Practices
Metrics to Track Progress	Share of cropland covered by conservation agriculture practices
	Number of manure management projects undertaken
Feasibility (cost, political will, technical capacity, etc.)	Added to the priority measures after stakeholder and public input

3.4 Low-Income Disadvantaged Communities Benefits Analysis

IRA Section 60114, which authorized the CPRG Program, includes a requirement that applicants "shall include information regarding the degree to which greenhouse gas air pollution is projected to be reduced in total and with respect to low-income and disadvantaged communities."[39] This requirement aligns with Section 223 of Executive Order 14008, which establishes a goal that 40% of the benefits of the federal government's climate investments flow to disadvantaged communities (Justice40 Initiative).[40] These requirements and the associated guidance from US EPA guided development of the engagement and benefits analysis efforts by NOACA and the City of Cleveland.

Identify LIDACs and Climate Impacts and Risks

In its technical guidance for CPRG Planning Grants, US EPA recommends that grant recipients utilize the Climate and Economic Justice Screening Tool (CEJST) and US EPA's Environmental Justice Screening and Mapping Tool (EJScreen) to identify LIDACs. Specifically, US EPA encourages grantees to define LIDACs as:

- "Any Census tract that is included as disadvantaged in the Climate and Economic Justice Screening Tool (CEJST); and/or
- Any census block group that is at or above the 90th percentile for any of EJScreen's Supplemental Indexes when compared to the nation or state, and/or any geographic area within Tribal lands and indigenous areas as included in EJScreen."[41]

Climate and Economic Justice Screening Tool (CEJST)
Executive Order 14008 required the White House Council on Environmental Quality (CEQ) to develop a screening tool to enable the federal government to comply with Justice40 requirements. CEJST provides information on the environmental and economic burdens that communities face within the U.S. It identifies eight categories of burdens and classifies a Census tract as disadvantaged if it is at or above the 90th percentile for one or more burdens and is at or above the 65th percentile for low income. Additionally, CEJST classifies a Census tract as disadvantaged if it is surrounded by other disadvantaged tracts and is at or above the 50th percentile for low income. Table 22 outlines these eight categories of burden and the indicators contained within each. Figure 23 provides a mapped location for each of these LIDAC Census tracts in the Cleveland-Elyria MSA.

[39] "H.R.5376 – 117th Congress (2021-2022): Inflation Reduction Act of 2022." Congress.gov, Library of Congress (retrieved 2.6.2024 from https://www.congress.gov/bill/117th-congress/house-bill/5376/text).
[40] United States, Executive Office of the President [Joseph Biden]. Executive Order 14088: Tackling the Climate Crisis at Home and Abroad. 27 January 2021. *Federal Register*, vol. 86, no. 19, pp.7619-7633 (retrieved 2.6.2024 from https://www.regulations.gov/document/EPA-HQ-OPPT-2021-0202-0012).
[41] U.S. Environmental Protection Agency Office of Air and Radiation, *Climate Pollution Reduction Grants Program: Technical Reference Document for States, Municipalities and Air Pollution Control Agencies Benefits Analyses: Low-Income and Disadvantaged Communities*, U.S. EPA, April 2023: 4 (retrieved 2.6.2024 from https://www.epa.gov/system/files/documents/2023-05/LIDAC%20Technical%20Guidance%20-%20Final_2.pdf).

Table 22. Categories and Types of Burden included in the CEJST[42]

Categories of Burden	*Types of Burden*	*Description*
Climate Change	Expected agricultural loss rate	Share of agricultural value at risk from fourteen types of natural hazards
	Expected building loss rate	Share of building value at risk from fourteen types of natural hazards
	Expected population loss rate	Share of total population at risk of fatality and injury from fourteen types of natural hazards
	Projected flood risk	The share of properties at risk of floods occurring in the next 30 years from tides, rain, riverine and storm surges
	Projected wildfire risk	The share of properties at risk of wildfires occurring in the next 30 years
Energy	Energy cost	Average household annual energy cost in dollars divided by the average household income
	$PM_{2.5}$ in the air	Fine inhalable particles with 2.5 or smaller micrometer diameters. The percentile is the weight of the particles per cubic meter
Health	Asthma	Share of people who answer “yes” to both questions: “Have you ever been told by a health professional that you have asthma?” and “Do you still have asthma?”
	Diabetes	Share of people ages 18 years and older who have been told by a health professional that they have

[42] Council on Economic Quality, “Climate and Economic Justice Screening Tool Methodology” (retrieved 2.6.2024 from https://screeningtool.geoplatform.gov/en/methodology).

		diabetes other than diabetes during pregnancy
	Heart disease	Share of people ages 18 years and older who have been told by a health professional that they had angina or coronary heart disease
	Low life expectancy	Average number of years people have left in their lives
Housing	Historic underinvestment	Census tracts that experienced historic underinvestment based on redlining maps created by the federal government's Home Owners' Loan Corporation (HOLC) between 1935 and 1940
	Housing cost	Share of households that are both earning less than 80% of Housing and Urban Development's Area Median Family Income and are spending more than 30% of their income on housing costs
	Lack of green space	Share of land with developed surfaces covered with artificial materials like concrete or pavement, excluding crop land used for agricultural purposes
	Lack of indoor plumbing	Housing without indoor kitchen facilities or complete plumbing facilities
	Lead paint	Share of homes built before 1960, which indicates potential lead paint exposure
Legacy Pollution	Abandoned mine land	Presence of an abandoned mine left by legacy coal mining operations
	Formerly used defense sites	Properties that were owned, leased, or possessed by the United States, under the jurisdiction of the Secretary of Defense, prior to October 1986

	Proximity to hazardous waste facilities	Number of hazardous waste facilities within 5 kilometers
	Proximity to Superfund sites	Number of proposed or listed Superfund or National Priorities list (NPL) sites within 5 kilometers
	Proximity to Risk Management Plan facilities	Count of Risk Management Plan (RMP) facilities within 5 kilometers
Transportation	Diesel particulate matter exposure	Mixture of particles in diesel exhaust in the air, measured as micrograms per cubic meter
	Transportation barriers	Average relative cost and time spent on transportation relative to all other tracts
	Traffic proximity and volume	Number of vehicles (average annual daily traffic) at major roads within 500 meters
Water and wastewater	Underground storage tanks and releases	Weighted formula of the density of leaking underground storage tanks and the number of all active underground storage tanks within 1,500 feet of the census tract boundaries
	Wastewater discharge	Risk-Screening Environmental Indicators (RSEI) modeled toxic concentrations at stream segments within 500 meters
Workforce development	Linguistic isolation	Share of households where no one over age 14 speaks English very well
	Low median income	Low median income calculated as a share of the area's median income
	Poverty	Share of people living at or below 100% of the Federal poverty level
	Unemployment	Number of unemployed people as a share of the labor force

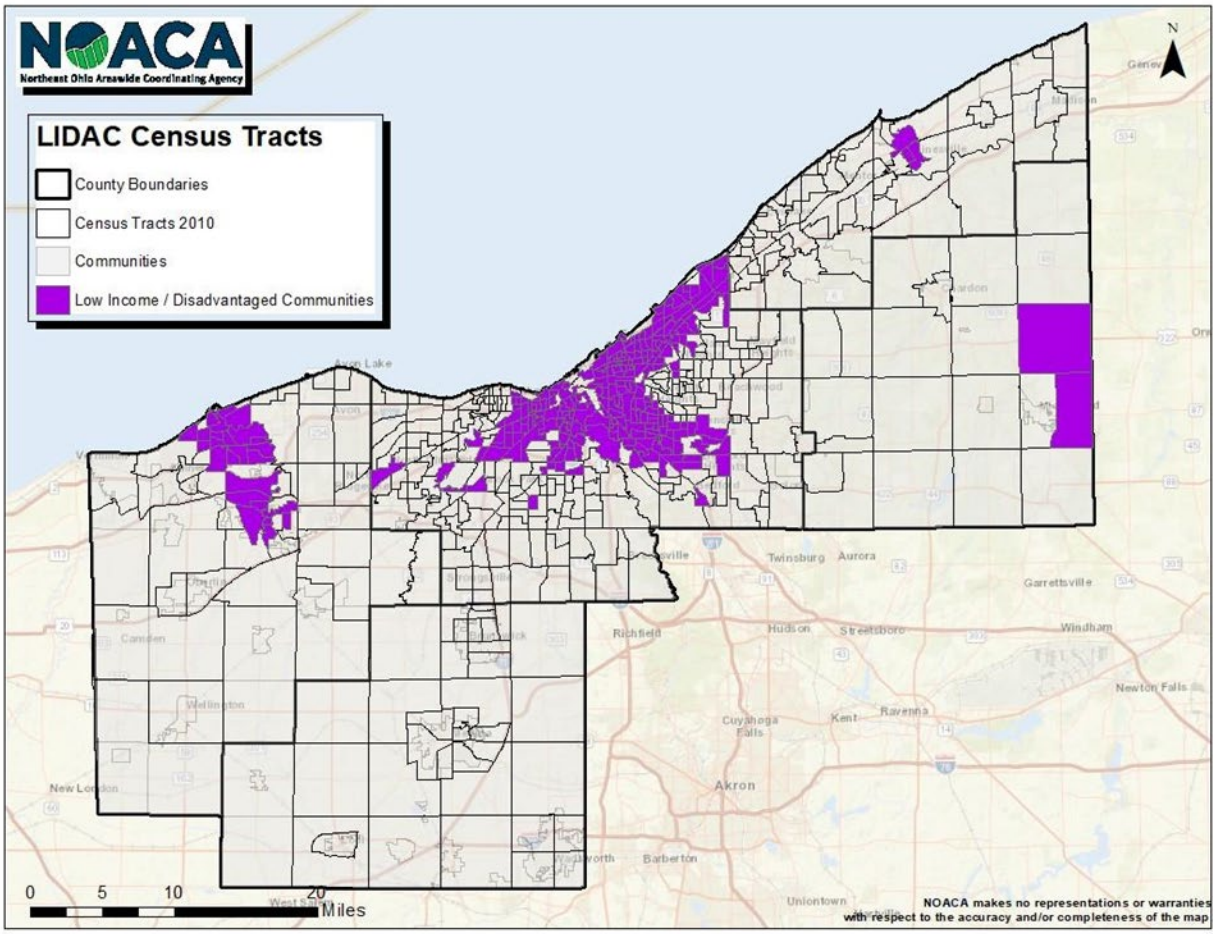


Figure 23: LIDAC Census Tracts in Cleveland-Elyria MSA

Table 23 identifies the ten Census tracts in the region that exceed at least seven CEJST categories.

Table 23. Cleveland-Elyria MSA Census Tracts that Exceed at least Seven CEJST Categories

County	*Census Tract*	*Number of CEJST Categories Exceeded*
Cuyahoga	39035150400	8
	39035109701	7
	39035110801	7
	39035111700	7
	39035110501	7
	39035105602	7
	39035108701	7
	39035103900	7
	39035105500	7
	39035108301	7

Environmental Justice Screening and Mapping Tool (EJScreen)

As noted, US EPA guidance also encourages CPRG planning grant recipients to use its EJScreen tool to identify LIDAC Census tracts. US EPA created the EJScreen tool to provide a consistent dataset and approach that combines environmental and socioeconomic indicators into a single environmental justice (EJ) tool. The dataset includes Census tract level data for 13 environmental indicators and seven socioeconomic indicators. Table 24 provides an overview of these indicators.

Table 24. Categories and Indicators included in the EJScreen Tool[43]

Category	*Indicator*	*Description*
Environmental	Particulate matter 2.5 ($PM_{.5}$)	Annual average $PM_{2.5}$ levels in the air
	Ozone	Average of the annual top ten daily maximum 8-hour ozone concentrations in the air
	Diesel particulate matter	Diesel particulate matter level in the air
	Air toxics cancer risk	Lifetime cancer risk from inhalation of air toxics
	Air toxics respiratory hazard index	Ratio of exposure concentration to health-based reference concentration
	Toxic Releases to air	Toxicity-weighted concentrations in air of Toxic Release Inventory (TRI) listed chemicals, based on modeled results from the 2021 Risk-Screening Environmental Indicators (RSEI)
	Traffic proximity and volume	Number of vehicles (average annual daily traffic) at major roads within 500 meters
	Lead paint	Share of homes built before 1960, which indicates potential lead paint exposure
	Superfund proximity	Number of proposed or listed Superfund or National Priorities list (NPL) sites within 5 kilometers
	Risk Management Plan (RMP) facility proximity	Count of RMP facilities within 5 kilometers

[43] U.S. EPA, "Understanding EJScreen Results" (retrieved 2.6.2024 from https://www.epa.gov/ejscreen/understanding-ejscreen-results).

	Hazardous waste proximity	Number of hazardous waste facilities within 5 kilometers
	Underground storage tanks (UST) and leaking UST (LUST)	County of LUSTs (multiplied by a factor of 7.7) and the number of USTs within a 1,500-foot buffered block group
	Wastewater discharge	RSEI modeled toxic concentrations at stream segments within 500 meters
Socioeconomic	People of color	Percent of individuals who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino
	Low income	Percent of a block group's population in households where the household income is less than or equal to twice the federal poverty level
	Unemployment rate	Percent of a block group's population that did not have a job at all during the reporting period
	Limited English speaking	Percent of people in a block group living in limited English speaking households
	Less than high school education	Percent of people aged 25 or older in a block group whose education is short of a high school diploma
	Under age 5	Percent of people in a block group under the age of 5
	Over age 64	Percent of people in a block group over the age of 64

In its LIDAC guidance, US EPA recommends that CPRG grant recipients classify Census tracts that score at or above the 90th percentile for any of EJScreen's Supplemental Indexes (SIs).

These 13 SIs combine each of the environmental indicators with a supplemental demographic index that includes five indicators: low income, unemployment rate, limited English speaking households, less than high school education, and low life expectancy.[44] Table 25 identifies the 13 Census tracts in the region that are at or above the 90th percentile on at least 12 SIs.

Table 25. Census Tracts at or above the 90th Percentile for at least 12 EJScreen SIs

County	*Census Tract*	*Number of EJScreen Supplemental Indexes at or above the 90th Percentile*
Cuyahoga	39035101101	13
	39035101800	13
	39035101901	13
	39035112301	13
	39035101400	12
	39035101501	12
	39035101603	12
	39035102101	12
	39035102300	12
	39035102402	12
	39035108301	12
	39035110901	12
	39035197900	12

NOACA and the City of Cleveland utilized both tools to identify LIDAC Census tracts within the Cleveland-Elyria MSA (see Appendix B). The next section provides an overview of the LIDAC areas within Northeast Ohio.

[44] U.S. EPA, "EJ and Supplemental Indexes in EJScreen," U.S. EPA (2024) (retrieved 2.6.2024 from https://www.epa.gov/ejscreen/ej-and-supplemental-indexes-ejscreen).

Low-Income and Disadvantaged Communities in the Cleveland-Elyria MSA

Based on US EPA's guidance, there are 277 LIDAC Census tracts located within the Cleveland-Elyria MSA. This number represents 43.4% of MSA tracts. The vast majority (244) of LIDAC Census tracts are in Cuyahoga County, while the remainder are divided among Geauga (two), Lake (three), and Lorain (28) Counties. There are no LIDAC Census tracts located in Medina County. The municipality with the largest number of LIDAC tracts is the City of Cleveland, which is home to 182 (65.7%) tracts. Other municipalities with significant numbers of LIDAC tracts include Lorain (18), Euclid (12), East Cleveland (11), and Elyria (10). LIDAC residents account for just over one-third (35.1%) of Northeast Ohio's 2.1 million people. Lorain County (50.7%) has the largest share of residents living in LIDAC tracts, followed by Cuyahoga (43%), Geauga (8.7%), and Lake (5.3%).

As one would expect, residents of LIDACs are far more likely to experience disadvantage according to a number of measures. While nearly one-third (31.2%) of Northeast Ohio residents identify as people of color, they are the majority (51.5%) in LIDACs. While 28.7% of all residents qualify as low income, that share reaches 44.3% in LIDAC tracts. Moreover, the unemployment rate in LIDACs (4.8%) is 50% higher than in the region (3.3%). Figures 24 and 25 show the Census tracts that are at or above the 90th percentile for the federal poverty level and unemployment rate, respectively.

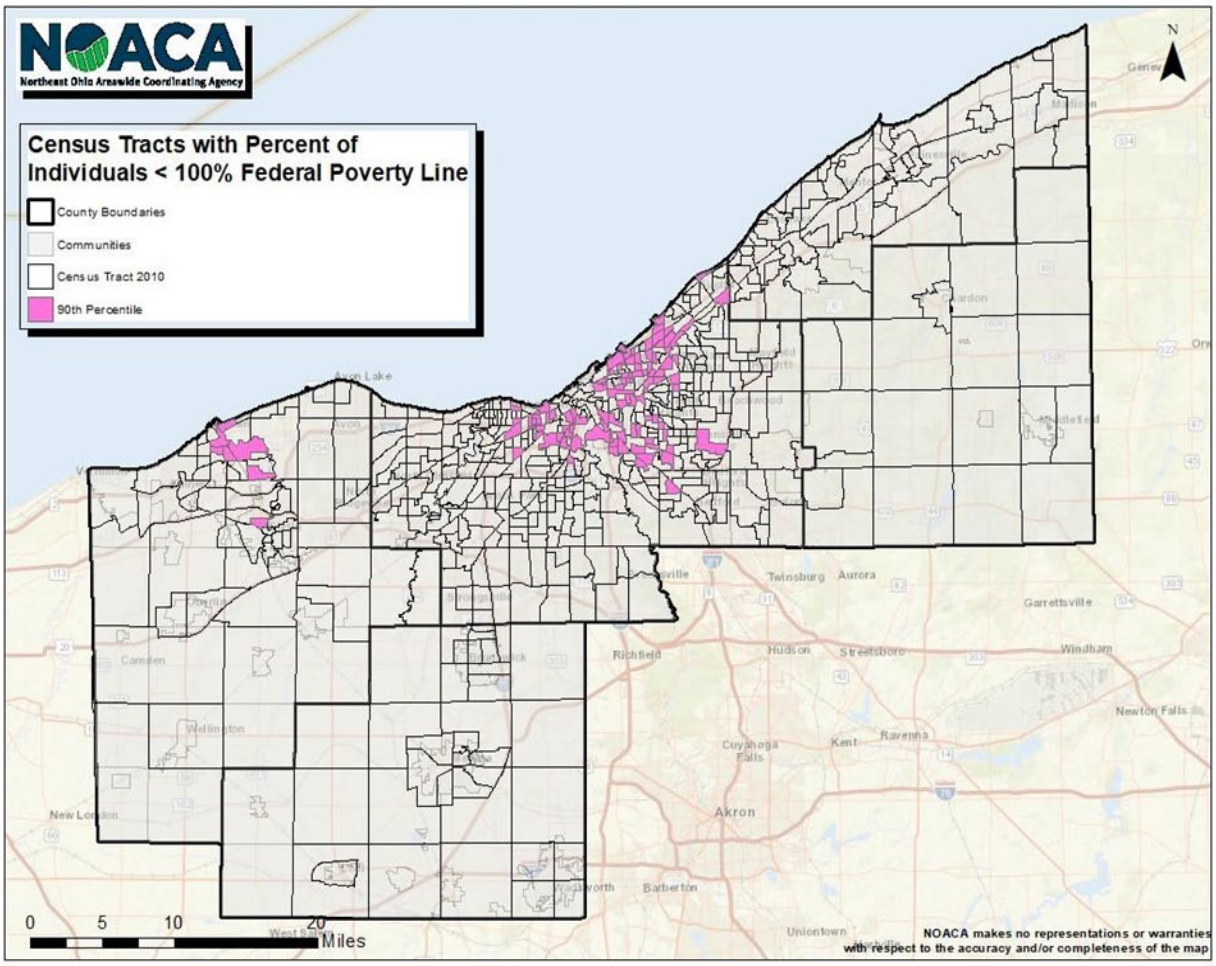


Figure 24. LIDAC Census Tracts at or above 90th Percentile for Federal Poverty Level

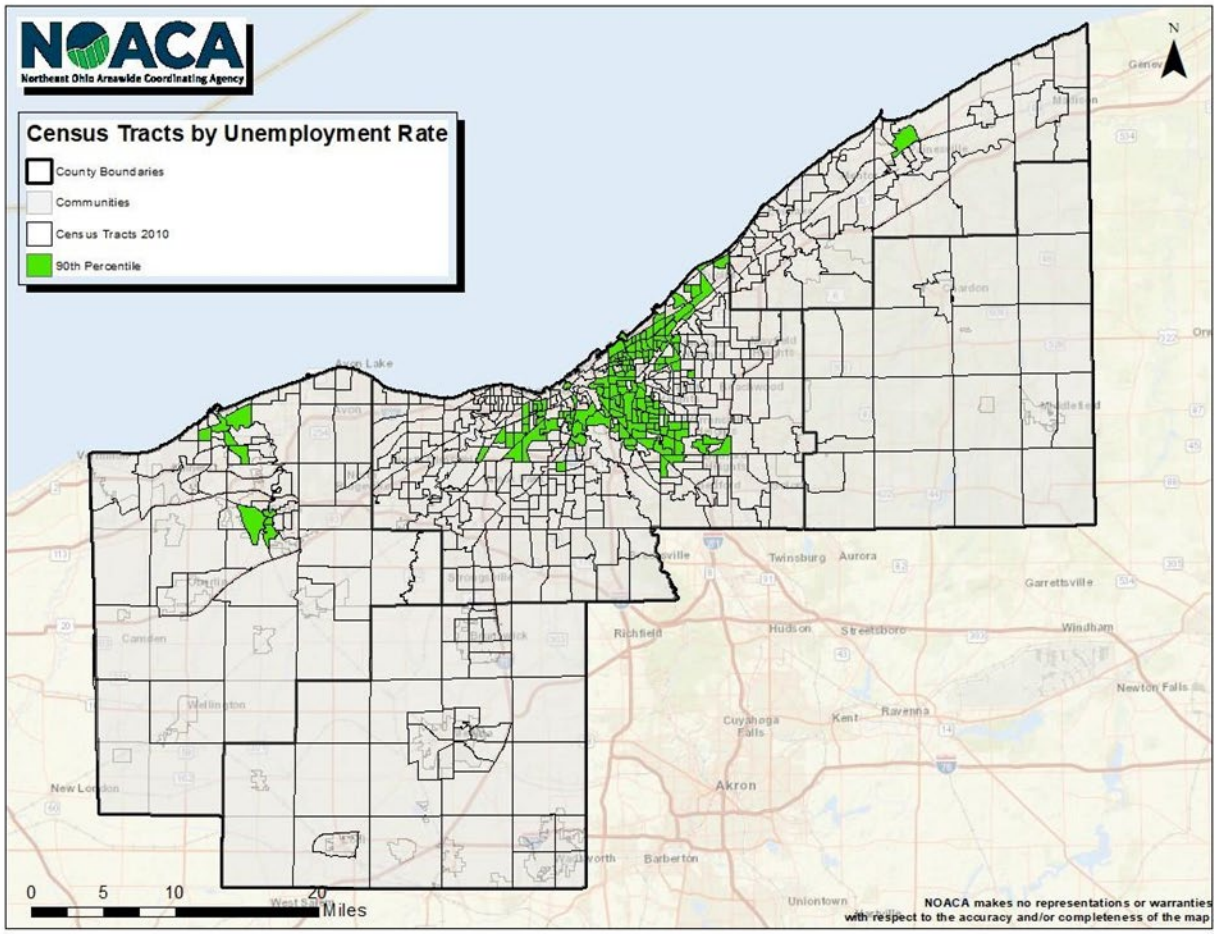


Figure 25. LIDAC Census Tracts at or above 90th Percentile for Unemployment Rate

LIDAC residents were (13.3%) far more likely to have less than a high school education than all Northeast Ohioans (8.6%), and they were slightly more likely to have limited English speaking households. Figure 26 illustrates the tracts at or above the 90th percentile for the share of adults with less than a high school education, while Figure 27 highlights tracts at or above the 90th percentile for linguistic isolation (i.e., limited English speaking households).

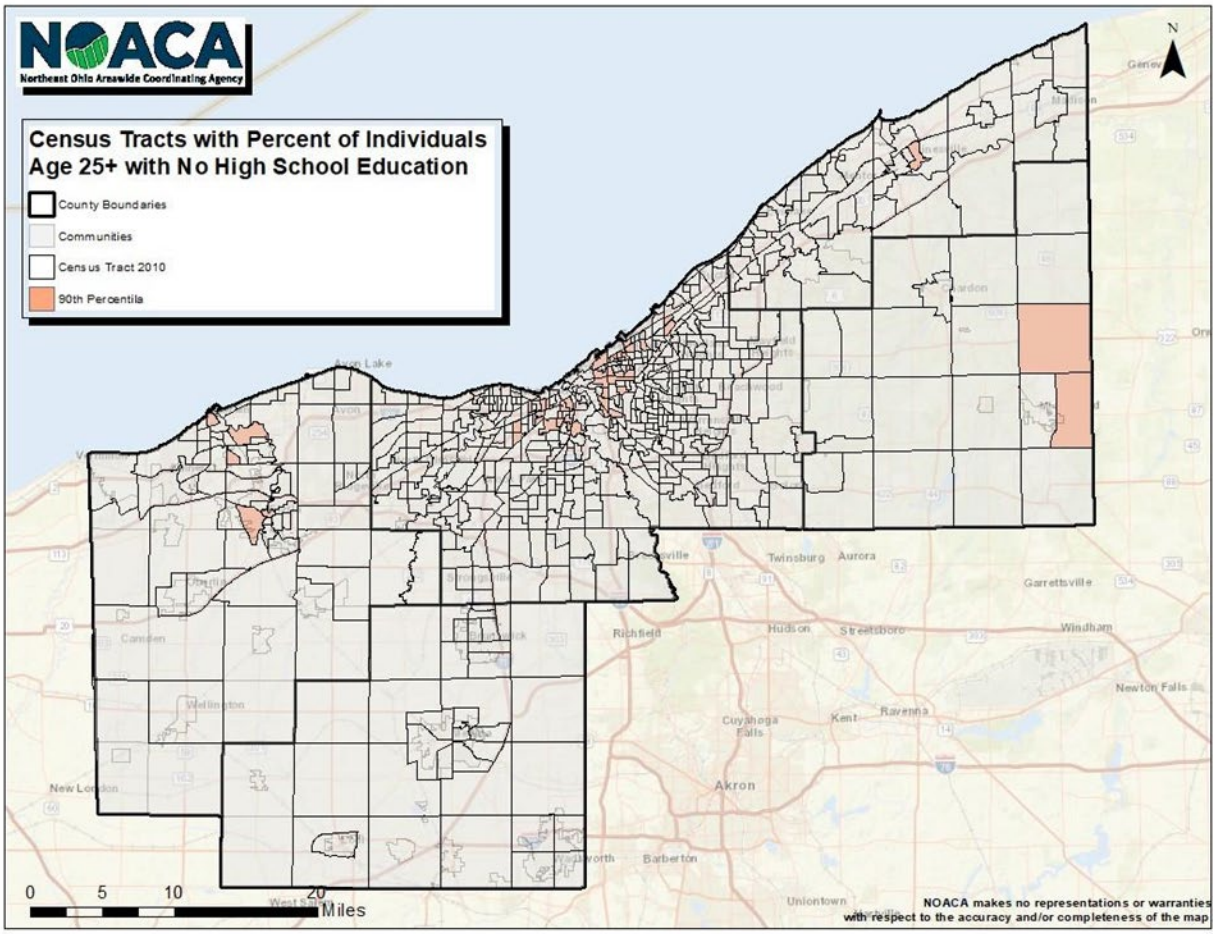


Figure 26. LIDAC Census Tracts at or above 90th Percentile for Less than High School Education

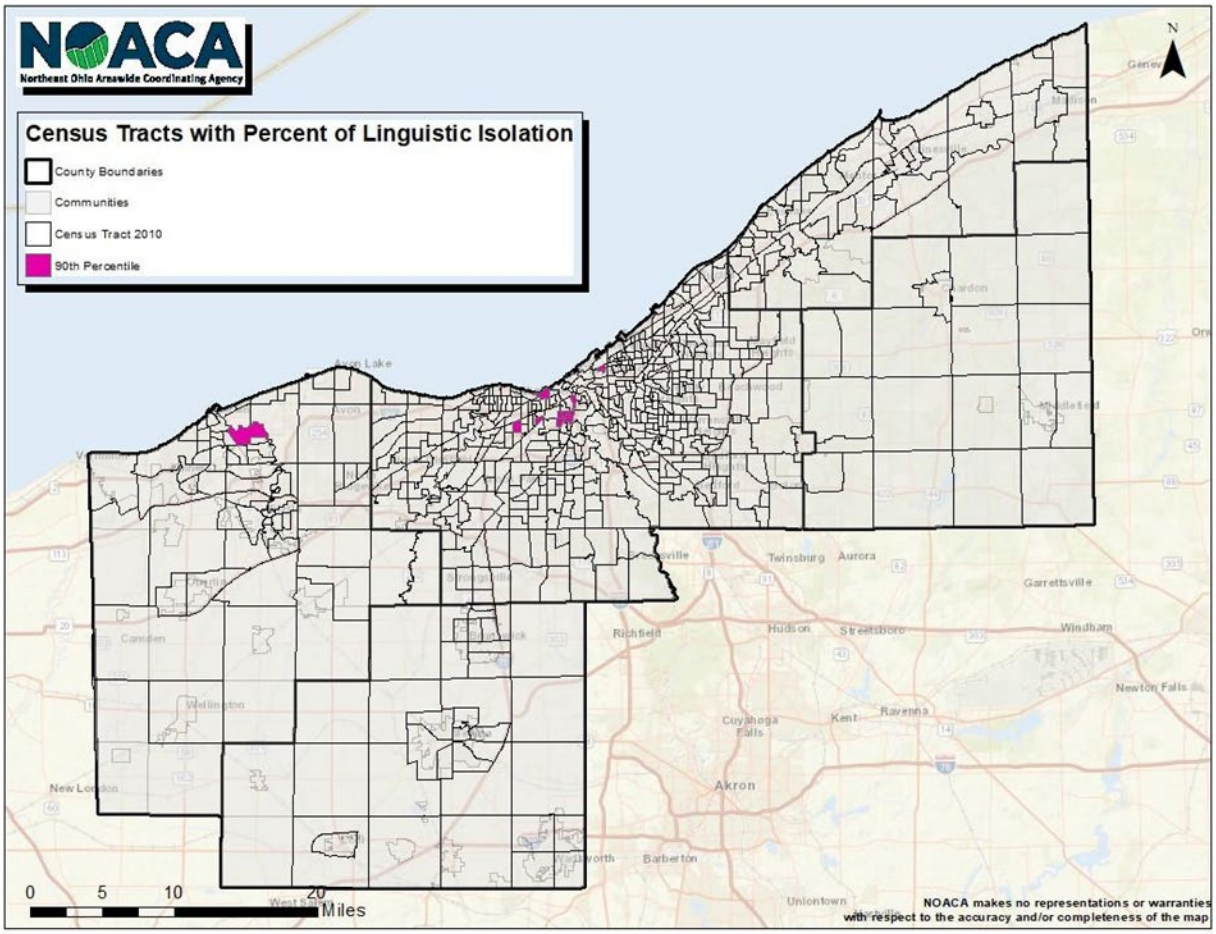


Figure 27. LIDAC Census Tracts at or above 90th Percentile for Linguistic Isolation

Additionally, LIDACs are exposed to heavier environmental burdens than other parts of the region; disadvantaged tracts experienced higher than average exposures to 11 of 13 EJScreen indicators, with the largest disparities for hazardous waste proximity, underground storage tanks, and RMP facility proximity. The only two indicators for which LIDAC areas had lower average exposures were Superfund proximity and wastewater discharge.

Climate Risks in the Cleveland-Elyria MSA

This section provides a summary view of the region's exposure to climate-related hazards. Information and data about past events, current exposure, and possible future conditions is described and synthesized. Relevant data points from climate projections are included, when available.

According to the Fourth National Climate Assessment, the primary climate-related hazards for the Midwest region of the United States are: **rising temperatures and extreme heat events**; **increased precipitation and flooding**; **changing seasonal patterns and drought**; and **pests,**

invasive species, and loss of biodiversity.[45] Changing climate conditions, pollution, and spread of invasive species threaten the Great Lakes, jeopardizing their ability to provide critical cultural and economic services, such as those related to tourism, natural resources (e.g. fisheries), flood control, and commerce.[46]

NOACA Climate Risk and Vulnerability Assessment

ICLEI USA reviewed available resources and localized climate projections to learn which hazards will most affect NOACA (Cleveland-Elyria MSA) counties, as well as to evaluate the seriousness of their impacts. The sources and projections indicate the following greatest threats from climate change: **changing seasonal patterns, heat waves and extreme hot days, heavy precipitation,** and **flooding**. After reviewing relevant climate data and projections through the CRVA Working Group during July-October 2022, NOACA stakeholders selected **extreme heat, heavy rainfall and flooding,** and **severe convective storms** as primary hazards of focus to assess regional vulnerability. Findings on these hazards are summarized below. Regional projections for temperature and precipitation indicators are from Temperate[47] unless otherwise cited.

It is noteworthy that NOACA staff, with its public engagement consultant (Joel Ratner Community Partners (JRCP)), conducted an extensive public engagement effort during July-October 2023. One of the questions requested attendees to "please select up to three (climate impacts) that you are most concerned about." The three concerns that received the most responses were: (1) Air Quality Issues/Pollution; (2) Heat; and (3) Flooding. Extremely poor air quality characterized the summer months of 2023 from Canadian wildfire smoke and mostly likely influenced that shift in importance for air quality.

The City of Cleveland conducted its own CRVA during the fall of 2023, which complements the NOACA assessment. Cleveland conducted a survey of people who live and work within the City to gather information on climate hazards, vulnerable populations, and vulnerable systems. The survey was open during October and November 2023. There were 399 total responses to the survey, which had a margin of error of 5%. Cleveland also enhanced these survey data through a series of facilitated discussions with subject matter experts and members of the public; these public engagement sessions are discussed in further detail later in this section. The climate impacts and risks outlined here are the product of these two CRVA processes.

Extreme Heat

Historically, Northeast Ohio has enjoyed a temperate climate that shielded it from the impacts of extreme heat. From 1961 to 1990, the region experienced less than one day per year where temperatures exceeded 95ºF, on average.[48] However, temperatures have increased in the

[45] U.S. Global Change Research Program (USGCRP), "Chapter 21: Midwest," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (2018) (retrieved 8.30.2022 from https://nca2018.globalchange.gov/chapter/21/).

[46] USGCRP, "Chapter 21: Midwest," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (2018) (retrieved 8.30.2022 from https://nca2018.globalchange.gov/chapter/21/).

[47] Azavea, Temperate: Your Climate Adaptation Planning Companion (retrieved 8.20.2022 from temperate.io).

[48] U.S. Federal Government, 2021. *The Climate Explorer* (retrieved 2.6.2024 from https://crt-climate-explorer.nemac.org/).

region over the past several decades. During 1951-2023, average annual temperatures in Northeast Ohio rose by 2.6ºF, higher than the increase for the U.S. as a whole.[49] Six of the region's 10 warmest years on record have occurred since 2010, including three since 2020, and more daily and monthly record high temperatures took place during the 2010s than during any other decade on record.[50]

While the increase in temperatures over the past few decades has been noticeable, projections for coming decades are particularly alarming. By mid-century, the annual average temperature in Northeast Ohio may increase by 3.4-3.9ºF. By the end of the century, that increase could reach 5.3-10.4ºF.[51] Rising temperatures will dramatically increase the risk of extreme heat events. By the end of the century, it may reach 95°F in the Cleveland-Elyria MSA as many as 52 days each year (see Figure 28). The number of days above 100ºF, something that has only happened 14 times in the 129-year weather record, could reach 1.5-2.5 and 4-22 days per year by 2050 and 2100, respectively. Both the frequency and duration of heat waves will increase significantly within Northeast Ohio; by 2050, the risk of a three-day heatwave nearly doubles to 80% per year.[52]

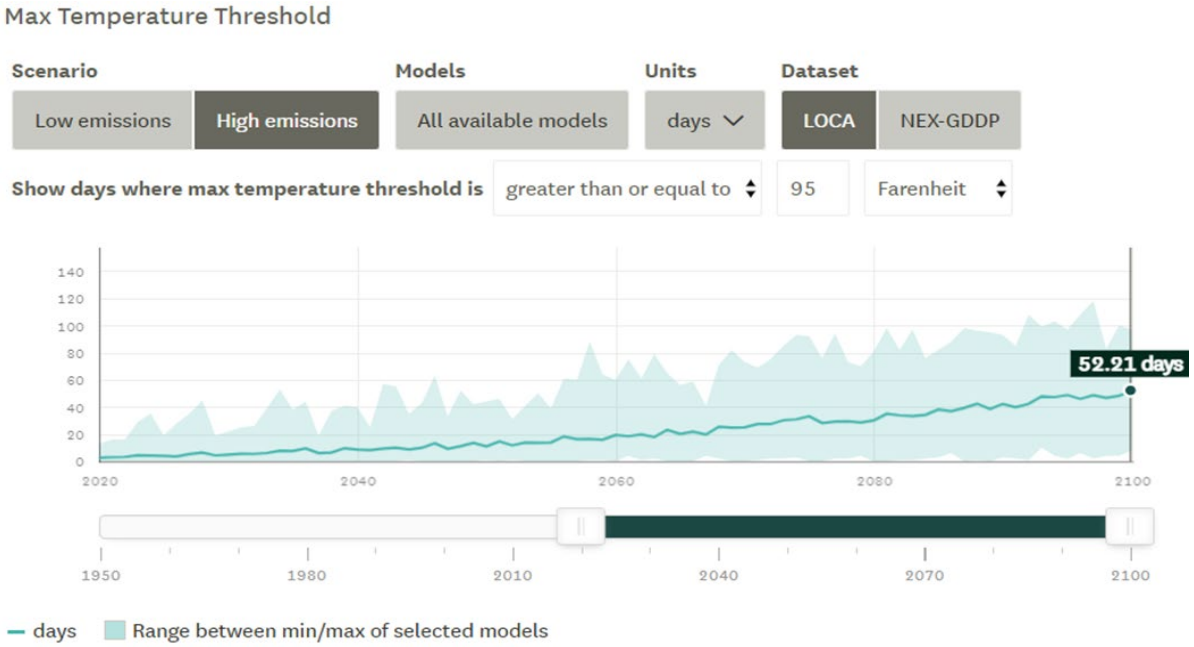


Figure 28. Maximum Temperature Threshold: Projections for the number of days per year when the temperature is 95°F or hotter in the Cleveland-Elyria MSA.[53]

[49] Great Lakes Integrated Science Assessment (GLISA), "Great Lakes Climatologies: Cleveland" (retrieved 2.6.2024 from https://glisa.umich.edu/station/cleveland/).

[50] National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental information (NCEI), 2024, "Climate at a Glance: Divisional Time Series" retrieved 2.6.2024 from https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/time-series).

[51] U.S. Federal Government, 2021. *The Climate Explorer*.

[52] First Street Foundation, 2024 "Heat Factor: Cleveland" (retrieved 2.5.2024 from https://riskfactor.com/city/cleveland-oh/3916000_fsid/heat).

[53] Azavea, Temperate: Your Climate Adaptation Planning Companion (retrieved 8.30.2022 from temperate.io).

Warm nights (days with a low temperature of 75°F or higher) are projected to increase precipitously by the end of the century. In recent years, the NOACA region averaged one or fewer warm nights per year. A minimal increase is projected in the short-term (2050), but by 2100, there may be 30 or more warm nights each year (Figure 29). Warm nights, which deny people and wildlife the opportunity to cool off from daytime temperatures, are particularly dangerous to health and well-being.[54]

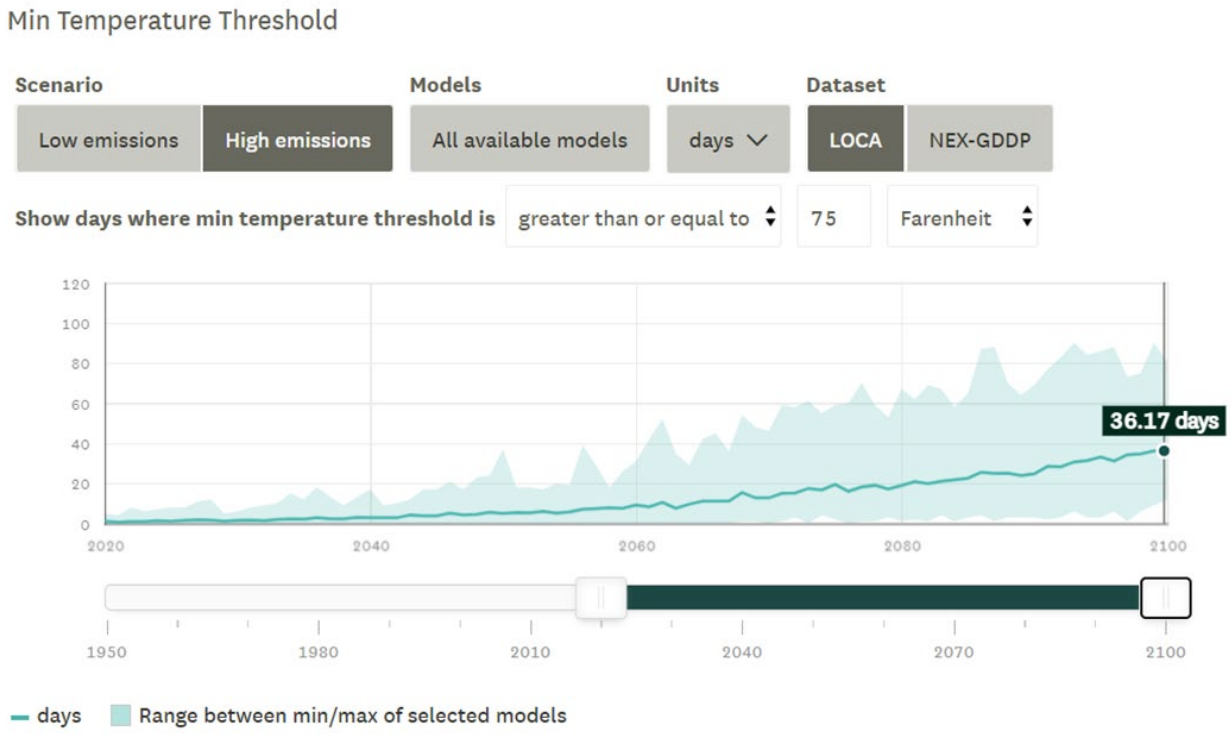


Figure 29. Minimum Temperature Threshold: Projections for the number of days per year when the minimum temperature is 75°F or hotter in the NOACA region.[55]

Heavy Precipitation and Flooding

The clearest way that Northeast Ohio will experience the impacts of climate change is from an increase in the frequency and intensity of heavy precipitation and flooding events. Annual precipitation has risen by 10.5 inches (29.6%) from 1951 to 2023.[56] A larger share of this precipitation is also falling during the most severe storms. Since the 1950s, the amount of precipitation falling during the heaviest 1% of events has risen by 45%, placing an additional strain on the region's stormwater infrastructure and increasing the risk of flash flood events.[57] The average number of days with more than one inch of precipitation has increased in all five

[54] USGCRP, "Chapter 2: Temperature-Related Death and Illness," in *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (2016) (retrieved 8.30.2022 from https://health2016.globalchange.gov/temperature-related-death-and-illness).

[55] Ibid.

[56] GLISA, "Great Lakes Climatologies: Cleveland."

[57] U.S. Global Change Research Program (USGCRP), 2023: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA (retrieved 2.6.2024 from https://doi.org/10.7930/NCA5.2023).

MSA counties since 1981. The smallest increase during that period was 0.8 day per decade in Lorain County, while the largest increase was 1.42 days per decade in Cuyahoga County.[58]

Projecting future changes in flood risk is complex due to the variety of factors involved in flooding. Climatic changes in rainfall and snowmelt are key drivers. However, other human and natural factors, including seasonality, urbanization patterns, land use change, dams, and stormwater and agricultural management practices are also highly relevant.[59] Flood Factor, a platform that provides community-level data on flood risk, takes some of these factors into account. Flood Factor models consider topography, hydrology, local climate and terrain characteristics, and future climatic changes to calculate flood risk.[60] Flood Factor outputs are based on probabilistic flood models developed by First Street Foundation.

On Flood Factor, Cleveland-Elyria MSA counties fall in the minor to moderate range. Even communities with minor levels of flood risk can expect flooding to have some impact on community life over the next 30 years. The county breakdown is shown in Table 26. Risk to critical infrastructure, a category that includes facilities like airports, police stations, wastewater treatment facilities, and power plants, appears to be the main driver.

[58] NOAA Regional Integrated Sciences and Assessments (RISA) Program, RAND Corporation, and Urban Sustainability Directors Network (USDN), 2022, *Climate Hazard and Mitigation Planning (CHaMP) Tool*, Santa Monica, CA: RAND Corporation (retrieved 2.6.2024 from https://www.rand.org/pubs/tools/TLA386-9.html).
[59] USGCRP, "Chapter 8: Droughts, Flooding, and Wildfire," in *Climate Science Special Report: Fourth National Climate Assessment, Volume I* (2017) (retrieved 8.30.2022 from https://science2017.globalchange.gov/chapter/8/).
[60] First Street Foundation, First Street Foundation Flood Model Technical Methodology Document (2020) (retrieved 8.30.2022 from https://assets.firststreet.org/uploads/2020/06/FSF_Flood_Model_Technical_Documentation.pdf)

Table 26. Flood risk rankings and top risk categories for Cleveland-Elyria MSA counties.[61]

County	Overall Community Flood Risk*	Top Risk Categories and Level
Lorain County	Minor	Commercial (Moderate), Critical Infrastructure (Moderate)
Medina County	Minor	Commercial (Moderate), Critical Infrastructure (Moderate)
Cuyahoga County	Moderate	Critical Infrastructure (Major)
Geauga County	Minor	Social Facilities (Moderate)
Lake County	Moderate	Critical Infrastructure (Major)

*Overall community flood risk is relative to other U.S. communities; it is based on flood likelihood and potential depth in the selected location now and in 30 years. This means that it reflects the level of risk to properties/facilities (i.e., flood likelihood and depth) **not** the proportion of properties/facilities that are at risk. It is calculated by averaging weighted risk scores assigned to five categories of properties (residential, roads, commercial, critical infrastructure, social facilities) within a community. The categories are weighted differently to reflect community disruption caused by damage to that property type.

Severe Summer Storms

Strong convective storms, including thunderstorms and windstorms, produce powerful winds, lightning, hailstones, tornadoes, and flash flood events that can damage property and affect people. These storms, also termed “severe summer storms,” are currently one of the most harmful forms of climate hazards in Northeast Ohio. Over the past decade (2014-2023), at least 255 summer storm events have caused property damage in the region. In total, these storms have caused $12.9 million in property damage, two deaths, and six injuries.[62] This total includes at least 14 tornado events, the most recent of which occurred August 24-25, 2023, when tornadoes touched down in all five counties within the region.[63]

[61] First Street Foundation, Risk Factor: Flood Factor (retrieved 8.30.2022 from https://riskfactor.com/).

[62] NOAA NCEI, *Storm Events Database*, 2020 (retrieved 2.6.2024 from https://www.ncdc.noaa.gov/stormevents/).

[63] National Weather Service (NWS), 2023, “Cleveland, OH: August 24-25, 2023 Damaging Wind Gusts and Tornadoes” (retrieved 2.6.2024 from https://www.weather.gov/cle/event_20230824_severe#:~:text=A%20number%20of%20measured%20or,the%20area%20were%20without%20power).

There remains uncertainty about how climate change will affect these types of summer storms. Nevertheless, research suggests these types of storms will become more frequent and intense due to a changing climate.[64] As discussed above, the amount of rain falling in these extreme events will continue to increase in the coming decades, given that a warming atmosphere can hold more moisture. This will raise the risks of damaging flash flood events. Furthermore, climate models suggest that average wind speeds may increase across all counties in the region by 2050, which could lead to a rise in the intensity of winds during summer storms.[65]

Poor Air Quality

Considering last summer's Canadian wildfires, poor air quality has emerged as the top climate hazard of concern for Northeast Ohio residents. While air quality has improved dramatically in the region since the passage of the 1970 Clean Air Act Amendments (CAAA), Northeast Ohio continues to face issues with ground-level ozone (O_3) and fine particulate matter ($PM_{2.5}$). Northeast Ohio experienced (unofficially) nine days of National Ambient Air Quality Standard (NAAQS) exceedance for fine particulate matter concentration due to the wildfire smoke in 2023. This number is equal to the total number of exceedance days in Northeast Ohio from fine particulate matter during all of the past decade (2013-2022).[66] A seven-county area, including the entire Cleveland-Elyria MSA, is currently a moderate nonattainment region for the 2015 National Ambient Air Quality Standard (NAAQS) for O_3, and Cuyahoga County may be designated a nonattainment area under the US EPA's new NAAQS for $PM_{2.5}$.[67]

Because climatic conditions affect the formation and transport of these pollutants, climate change threatens to undermine or, potentially, even reverse some of the region's air quality improvements. US EPA projects that O_3 levels in the Midwest may increase by 1-5 parts per billion (ppb) and up to 10 ppb by 2050 and 2100, respectively.[68] Under moderate and high warming scenarios, EPA also estimates that O_3-related mortality rates could increase by 50% or more for various population groups in the Midwest.[69] Increased precipitation may reduce $PM_{2.5}$ levels within Northeast Ohio, as US EPA forecasts that annual $PM_{2.5}$ will decline by 1.5 micrograms per cubic meter ($\mu g/m^3$) in the Midwest. This decrease would have clear public health benefits, as it would lead to reduction in premature deaths and incidence of asthma within Northeast Ohio.[70] However, this reduction is not guaranteed; under higher warming

[64] USGCRP, 2018. "Chapter 2: Our Changing Climate," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (retrieved 2.6.2024 from https://nca2018.globalchange.gov/chapter/2/).
[65] Argonne National Laboratory (ANL), 2023, Climate Risk and Resilience Portal (ClimRR), Chicago: UChicago Argonne, LLC (retrieved 2.6.2024 from https://climrr.anl.gov/).
[66] Northeast Ohio Areawide Coordinating Agency (2023), 2022 Air Quality Trends Report (retrieved 11.12.2023 from https://www.noaca.org/home/showpublisheddocument/29603/638157747909470000).
[67] U.S. EPA, "Final Reconsideration of the National Ambient Air Quality Standards for Particulate Matter (PM)" (retrieved 2.6.2024 from https://www.epa.gov/pm-pollution/final-reconsideration-national-ambient-air-quality-standards-particulate-matter-pm).
[68] Nolte, Christopher G., et al. "Regional temperature-ozone relationships across the US under multiple climate and emissions scenarios." *Journal of the Air & Waste Management Association* 71.10 (2021): 1251-1264.
[69] U.S. EPA, 2021, *Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts* (retrieved 2.6.2024 from www.epa.gov/cira/social-vulnerability-report).
[70] Ibid.

scenarios (i.e. 3ºC or above), $PM_{2.5}$ levels actually increase in Northeast Ohio.[71] This outcome may be a product of increased wildfire activity outside of Northeast Ohio, as the region experienced during the summer of 2023. Due to persistent wildfires throughout Canada, Northeast Ohio endured its highest and second-highest daily $PM_{2.5}$ levels ever on June 28 and 29, 2023. Recent research suggests that wildfires in other regions have been undermining Northeast Ohio's air quality for a decade.[72]

Impacts of Climate Risks on Disadvantaged Communities

While climate change and extreme weather events will affect all portions of Northeast Ohio in some way, those impacts will not be felt equally. Certain groups will suffer worse effects due to their underlying vulnerabilities. While a healthy adult who works indoors and has access to reliable air conditioning may find a heatwave to be a nuisance, those same conditions may present an acute threat to outdoor workers, the elderly, or people with preexisting health conditions. While a severe summer storm may be an inconvenience for someone who loses power or experiences basement flooding, that same storm can be extremely risky for someone experiencing homelessness or a person who needs to keep his or her medication refrigerated. These different factors are known as "social vulnerability." Social vulnerability factors determine how susceptible a person or social group is to suffering adverse impacts from natural hazards, such as injury, death, property loss, or livelihood disruption.[73] As the United States Global Change Research Program (USGCRP) has explained: "While all Americans are at risk, some populations are disproportionately vulnerable, including those with low income, some communities of color, immigrant groups (including those with limited English proficiency), Indigenous peoples, children and pregnant women, older adults, vulnerable occupational groups, persons with disabilities, and persons with preexisting or chronic medical conditions."[74]

The Centers for Disease Control and Prevention (CDC) developed the Social Vulnerability Index (SVI) to better assess social vulnerability across the United States. The SVI combines 16 different social factors into four themes – socioeconomic status, household characteristics, racial and ethnic minority status, and housing type and transportation – and develops a single SVI score for every Census tract. Figure 30 outlines the social factors used in the SVI.

[71] Ibid.

[72] Burke, Marshall, et al. "The contribution of wildfire to PM2. 5 trends in the USA." *Nature* 622.7984 (2023): 761-766.

[73] Federal Emergency Management Agency (FEMA), "National Risk Index: Social Vulnerability" (retrieved 2.6.2024 from https://hazards.fema.gov/nri/social-vulnerability).

[74] USGCRP, 2016, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (retrieved 2.6.2024 from https://health2016.globalchange.gov/).

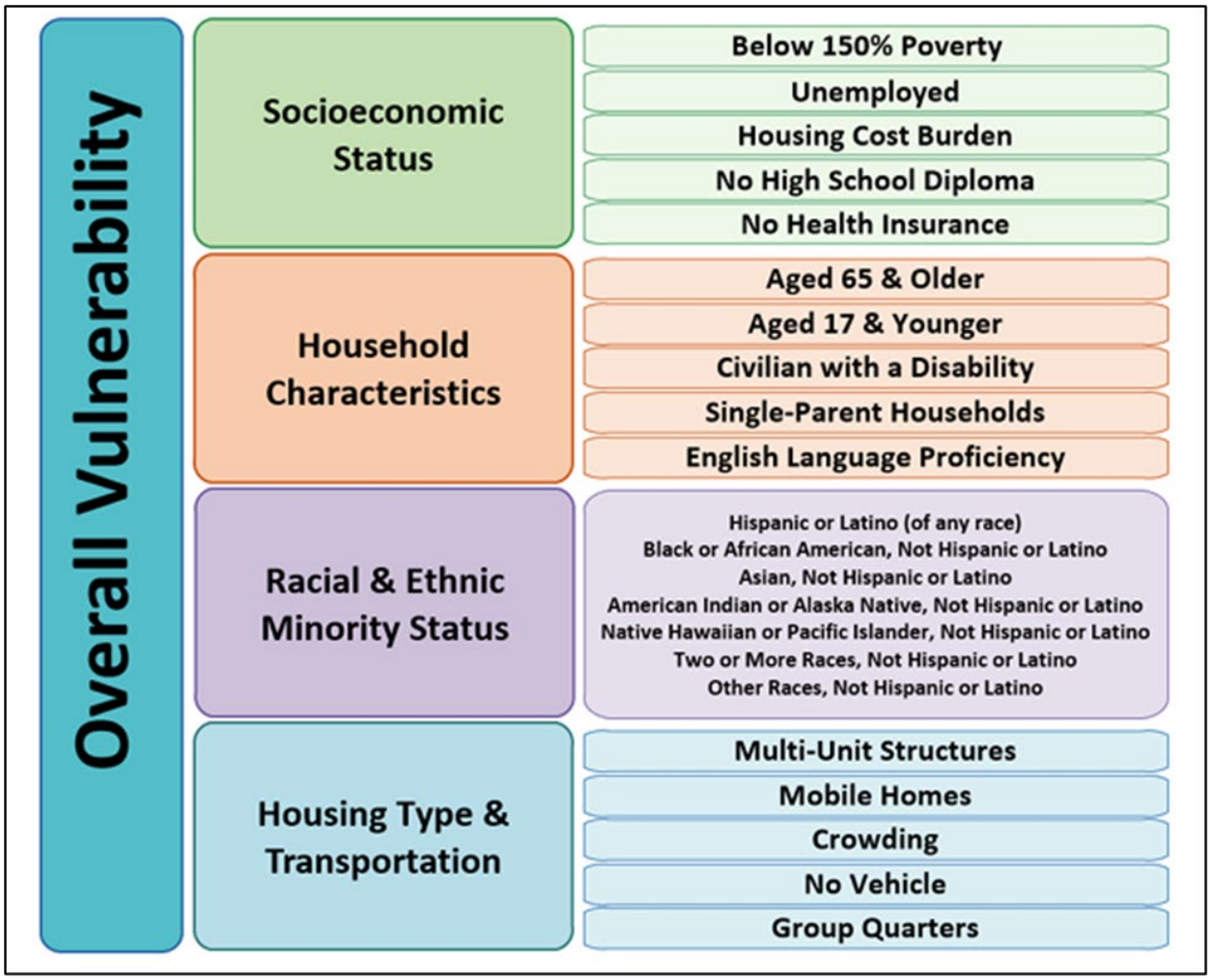


Figure 30. SVI Social Factors and Themes[75]

There are 61 LIDAC Census tracts in Northeast Ohio that score at or above the 90th percentile on the SVI. Figure 31 highlights these tracts. Of these, 53 (86.9%) tracts are in Cuyahoga County, with the rest split between Lake (two) and Lorain (six) Counties.

[75] CDC/ATSDR, "SVI 2020 Documentation" (retrieved 2.6.2024 from https://www.atsdr.cdc.gov/placeandhealth/svi/documentation/pdf/SVI2020Documentation_08.05.22.pdf).

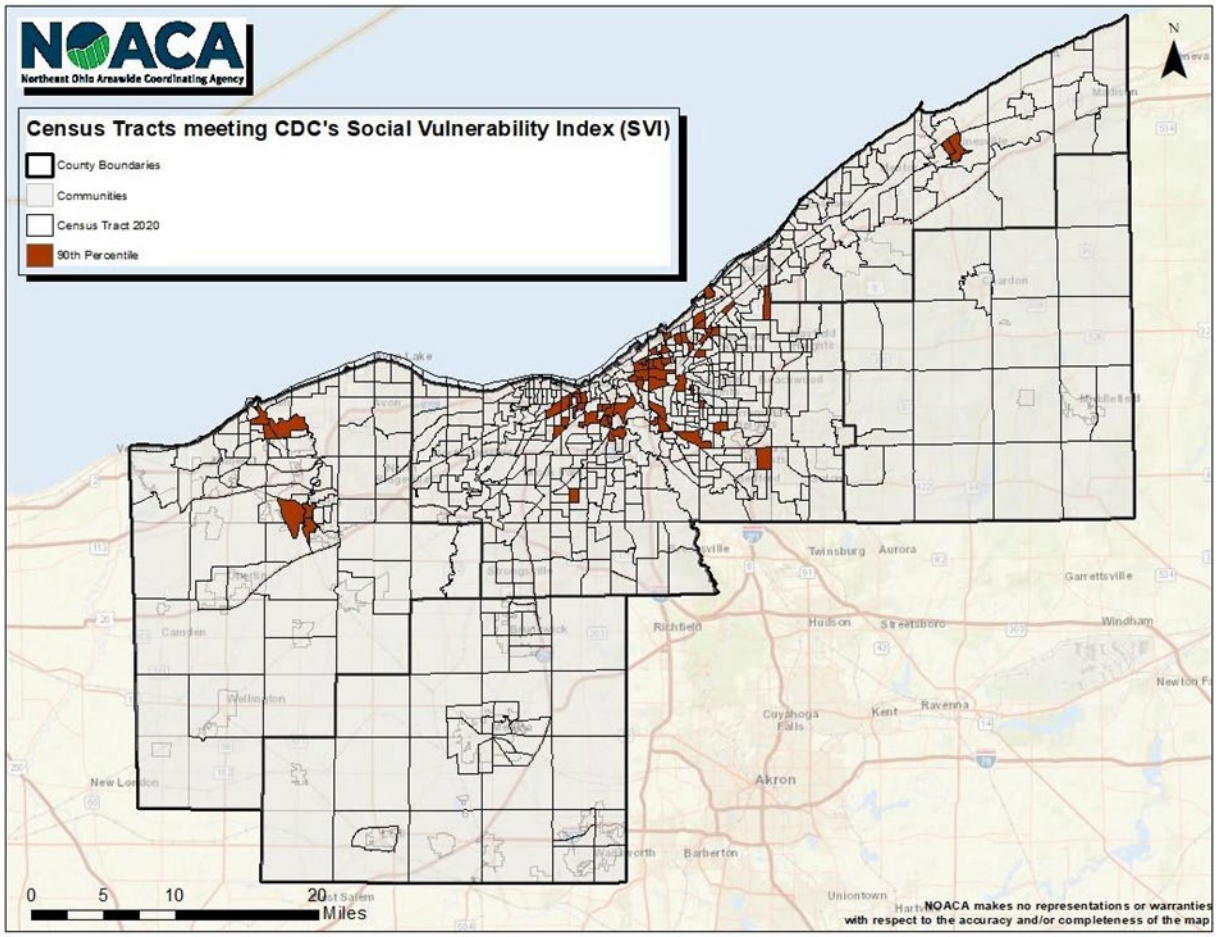


Figure 31. Census Tracts at or above the 90th Percentile for the SVI

Social vulnerability has a number of significant, real world implications. Communities that are more vulnerable to climate change and extreme weather are also more likely to suffer the adverse effects of everyday stressors. As a result, residents of these communities may find that their physical and mental health and quality of life suffer, leading to health disparities. These disparities can be stark. For instance, despite being just two miles apart, the life expectancy for residents in Shaker Heights' Census tract 39034183401 is more than 23 years longer than the life expectancy in Cleveland's Census tract 39035119202.[76] Figure 32 identifies LIDAC areas in Northeast Ohio with low life expectancies.

[76] Warren, Kate, and Joe Ahern, 2019, *The poorer your neighborhood, the shorter your life*, Cleveland: Center for Community Solutions (retrieved 2.6.2024 from https://www.communitysolutions.com/research/life-expectancy-race-ohio/).

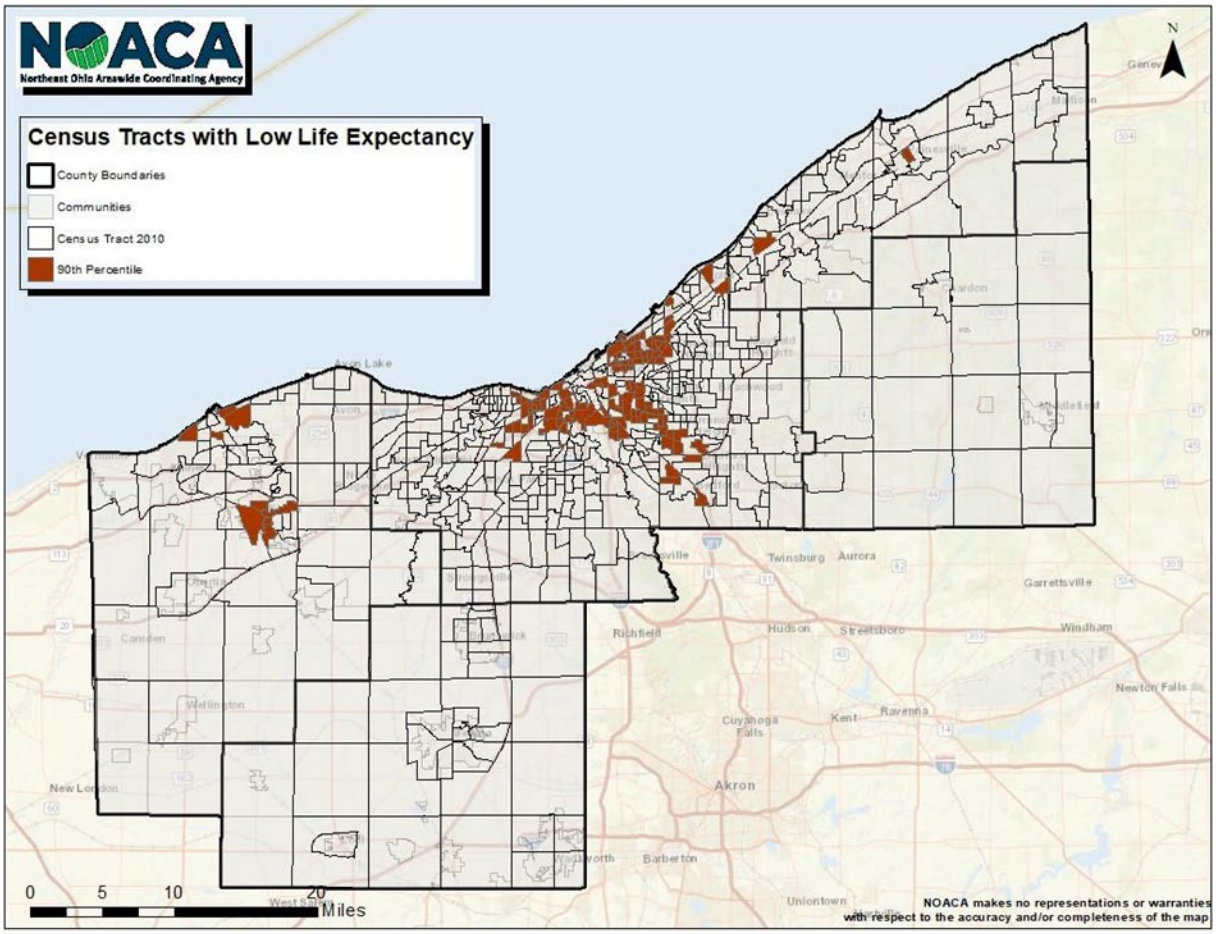


Figure 32. LIDAC Census Tracts with Low Life Expectancy

During the development of their CRVAs, NOACA and the City of Cleveland gathered feedback from residents and stakeholders on which population groups are uniquely vulnerable to the four climate hazards discussed earlier. This section examines the results of these engagement efforts.

Population Groups Vulnerable to Extreme Heat

One group particularly susceptible to the health impacts of extreme heat is people who live with disabilities or other medical conditions. Elevated temperatures can exacerbate an array of underlying health conditions, including cardiovascular disease, cerebrovascular disease, diabetes, and respiratory illnesses.[77] People who suffer from mental illnesses and substance abuse disorders are also at a higher risk; mental illness can triple the risk of heat-related mortality.[78] Children and the elderly also face higher risks from extreme heat, as their bodies are

[77] USGCRP, *The Impacts of Climate Change on Human Health*, 222.

[78] Zanobetti, Antonella, et al. "Susceptibility to mortality in weather extremes: effect modification by personal and small area characteristics in a multi-city case-only analysis." *Epidemiology* 24.6 (2013): 809.

less equipped to regulate temperature. Pregnant people are also particularly vulnerable, and extremely high temperatures can increase the risk of pregnancy complications.[79] Furthermore, people who work outdoors are more susceptible to the impacts of extreme heat, as they typically endure extreme elements for several hours per day. This level and extent of exposure threatens their health and undermines their productivity.[80]

The environments in which people live affects their vulnerability to rising temperatures. People who live in formerly redlined neighborhoods endure higher ambient temperatures due to the urban heat island effect. Because these neighborhoods are more likely to have high rates of heat-related land cover (e.g. impervious surfaces (i.e. pavement), less tree canopy), redlined neighborhoods in the Cleveland-Elyria MSA are, on average, 2.6ºC (4.7ºF) warmer than other parts of the region.[81] Figure 33 identifies redlined Census tracts located in Northeast Ohio. Additionally, people who live in aging and low quality housing stock, and those who spend a higher share of their incomes on home energy costs, have higher risks, as it is harder for them to keep their home environments cool during periods of high temperatures.

[79] USGCRP, *The Impacts of Climate Change on Human Health*, 256.

[80] Licker, Rachel, Kristina Dahl, and John T. Abatzoglou. "Quantifying the impact of future extreme heat on the outdoor work sector in the United States." *Elem Sci Anth* 10.1 (2022): 00048.

[81] Hoffman, Jeremy S., Vivek Shandas, and Nicholas Pendleton. "The effects of historical housing policies on resident exposure to intra-urban heat: a study of 108 US urban areas." *Climate* 8.1 (2020): 12

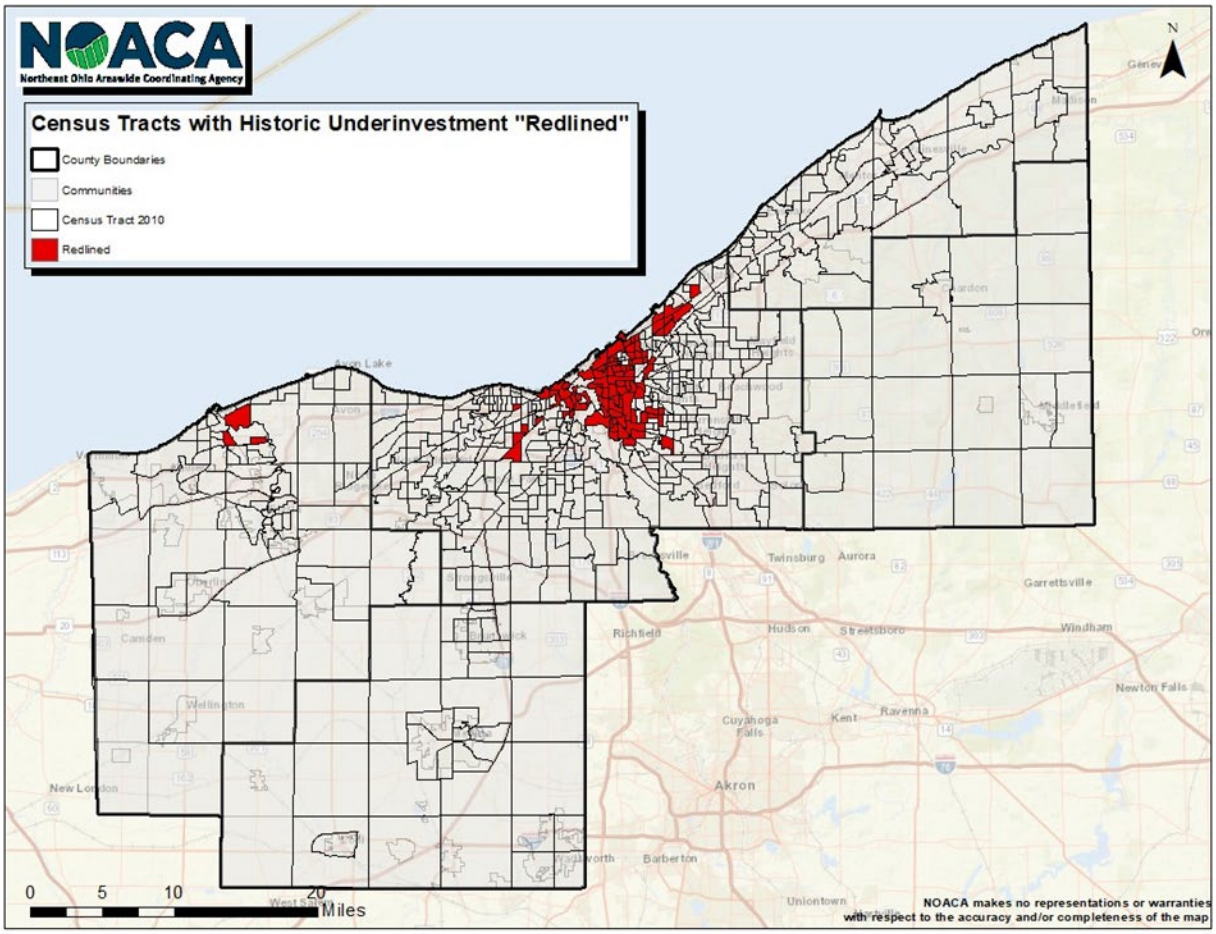


Figure 33. LIDAC Census Tracts that Experienced Historic Underinvestment (Redlining)

Population Groups Vulnerable to Heavy Precipitation and Flooding

A handful of groups appear particularly susceptible to the negative impacts of heavy precipitation and flooding in Northeast Ohio. People who experience homelessness tend to live in marginal areas that may place them at more acute risk to floods.[82] Disaster planning processes have also historically excluded homeless populations, making them more vulnerable through their marginalization. Outdoor workers also face a higher risk from extreme precipitation and flooding, as they may work in higher risk occupations necessitated by the disaster event, such as search-and-rescue efforts or infrastructure repair. The built environment also makes certain communities more vulnerable, as more impervious surfaces and less green space can increase runoff and make flash flooding more likely. Lastly, poor quality housing is more likely to suffer damage from heavy precipitation events. Figures 34 and 35 identify LIDAC areas with higher levels of impervious surfaces and aging housing stock.

[82] Ramin, Brodie, and Svoboda. "Health of the homeless and climate change." *Journal of Urban Health* 86 (2009): 654-664.

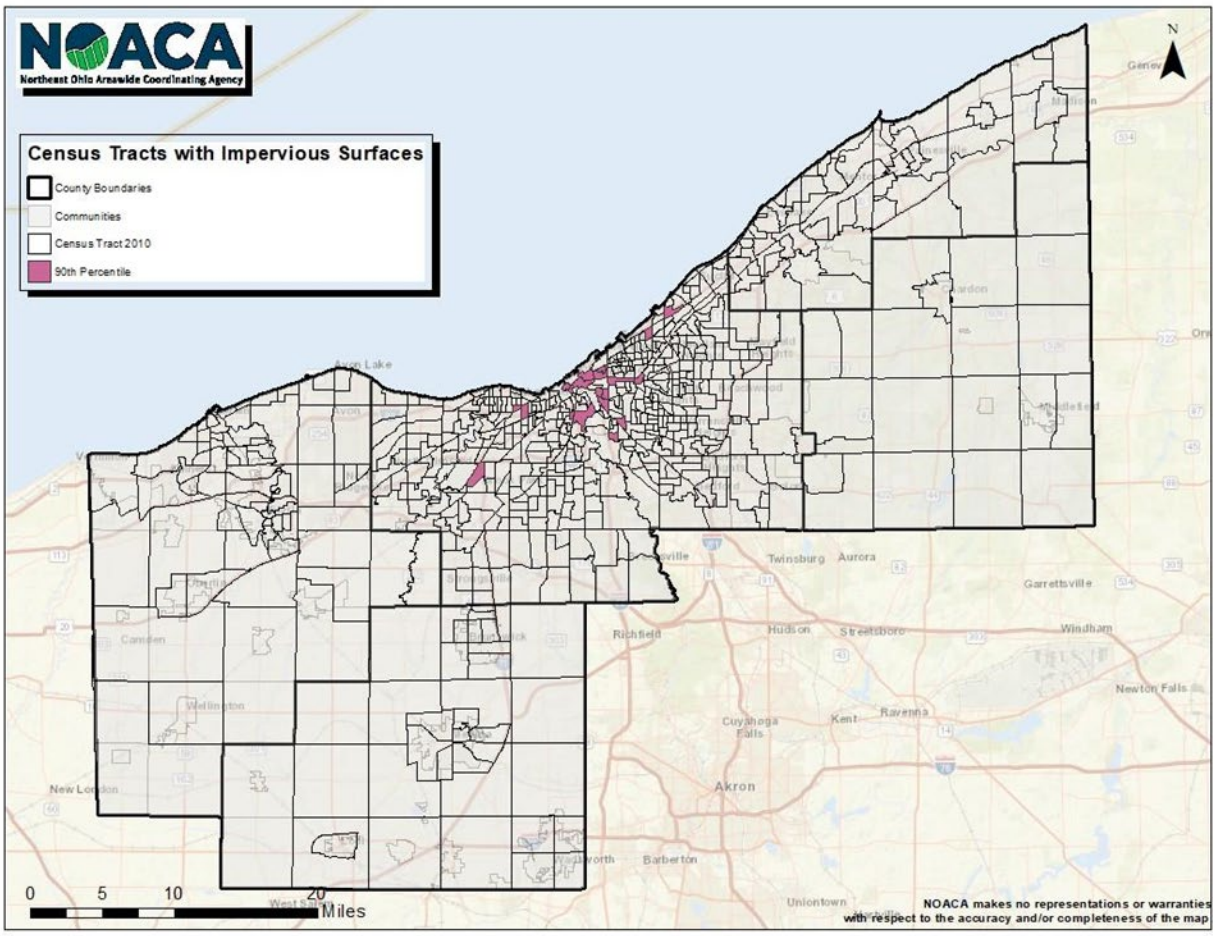


Figure 34. LIDAC Census Tracts at or above the 90th Percentile for Impervious Surfaces

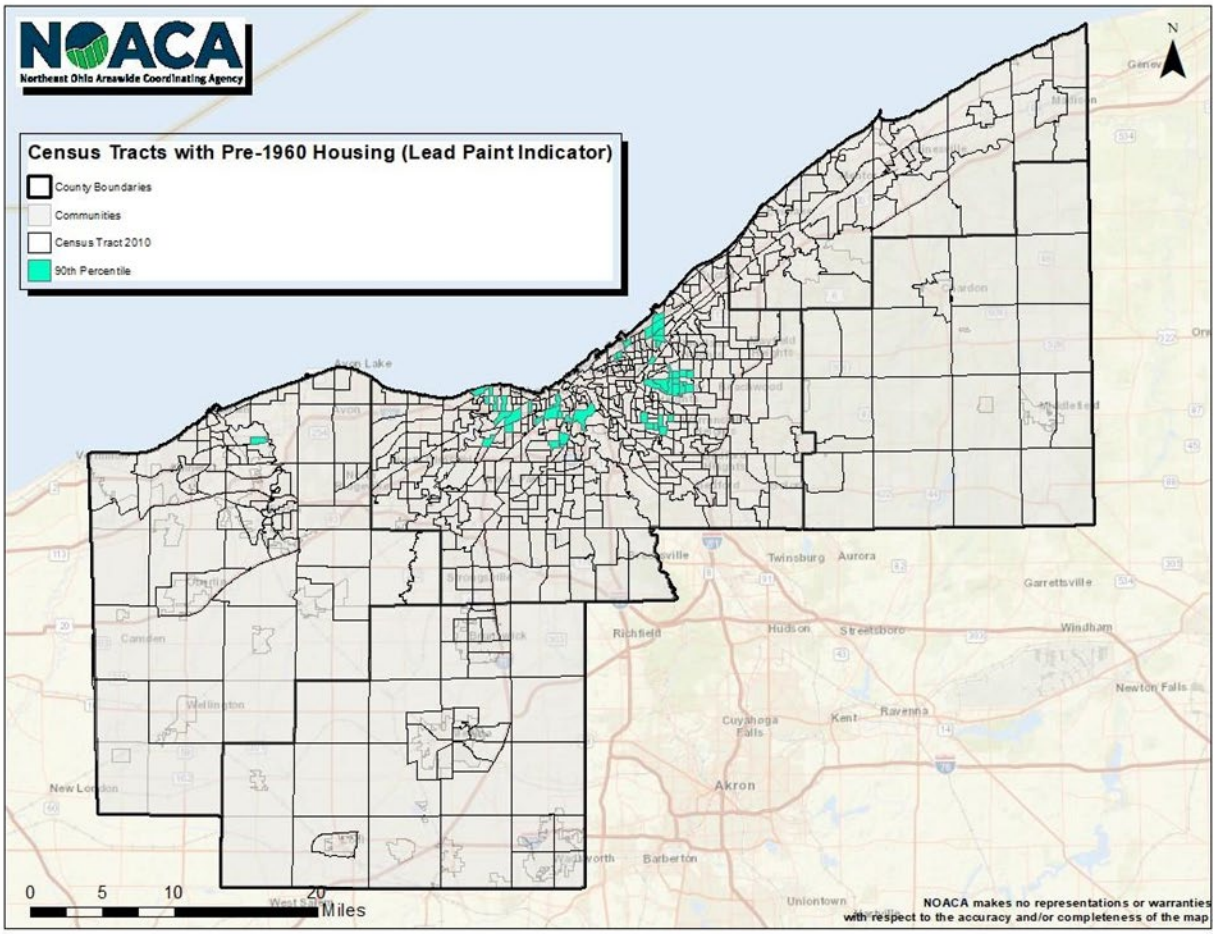


Figure 35. LIDAC Census Tracts at or above the 90th Percentile for Pre-1960s Housing

Severe Summer Storms

Many of the same groups at risk from heavy precipitation and flooding are also vulnerable to severe summer storms. People who live in older housing stock and have low income are more likely to suffer property damage and be at heightened personal risk from severe storms. People with disabilities and underlying health issues are also at greater risk. Individuals with mobility needs (e.g., wheelchairs) may have trouble evacuating during a severe storm event. Those living with hearing, vision, or intellectual disabilities may neither be fully aware of, nor understand, the information shared during emergency events.[83] And those who rely on medical equipment, such as portable oxygen and electric wheelchairs, are uniquely vulnerable to prolonged power outages.[84]

[83] Alexander, David, J. C. Gaillard, and Ben Wisner. "Disability and disaster." *The Routledge handbook of hazards and disaster risk reduction* 1 (2012): 413-423.
[84] USGCRP, *The Impacts of Climate Change on Human Health*, 222.

Poor Air Quality

Outdoor workers are among those on the front lines of poor air quality. Given that they work outside for hours at a time, they face longer exposures to elevated air pollution than other groups. Strenuous physical activity also causes a person to breathe more frequently, increasing pollution inhalation.[85] People experiencing homelessness also face prolonged exposure to air pollution and have limited opportunities to escape it. The homeless often live in areas with elevated baseline pollution levels, such as along heavily trafficked roads, and they are more likely to have underlying health conditions that air pollution can worsen. For the homeless, "poor air quality is a present, often acute, corporeal, embodied, physical, and psychological experience."[86] Lastly, children, the elderly, and people with disabilities and medical conditions are also at higher risk. Children spend more time outdoors, have smaller lungs, and breathe in more air, relative to their body size, than adults.[87] And air pollution takes a greater toll on the health of the elderly and people with preexisting health conditions than it does for the general population.

Public Outreach and Engagement within LIDACs

Both NOACA and the City of Cleveland conducted public engagement and outreach within LIDACs during the summer and fall of 2023. The following sections describe each of their outreach efforts.

Overview of NOACA Public Engagement in LIDAC Areas

NOACA conducted an extensive community engagement process in the five-county region between July and October 2023. Throughout the process, NOACA made an intentional and strategic effort to engage residents and stakeholders authentically in low-income and disadvantaged places. Overall, the efforts successfully yielded significant input from those communities. In total, NOACA conducted 30 community engagement sessions (i.e., Focus Groups) in the five-county region. Of those, 15 occurred in a LIDAC, including the initial two pilot workshops (City of Cleveland and Shaker Heights). NOACA also conducted several Climate Fresk workshops, during which NOACA staff provided attendees information about climate change and discussed different ways to act; posted interactive climate information kiosks throughout the region; and provided an instrument for online input (300 respondents). Figures 36-38, below, show the physical locations of the first three engagement activities throughout Northeast Ohio.

[85] Applebaum, Katie M., et al. "An overview of occupational risks from climate change." *Current environmental health reports* 3 (2016): 13-22.
[86] DeMarco, Angelina L., et al. "Air pollution-related health impacts on individuals experiencing homelessness: Environmental justice and health vulnerability in Salt Lake County, Utah." *International Journal of Environmental Research and Public Health* 17.22 (2020): 10.
[87] USGCRP, *The Impacts of Climate Change on Human Health*, 256.

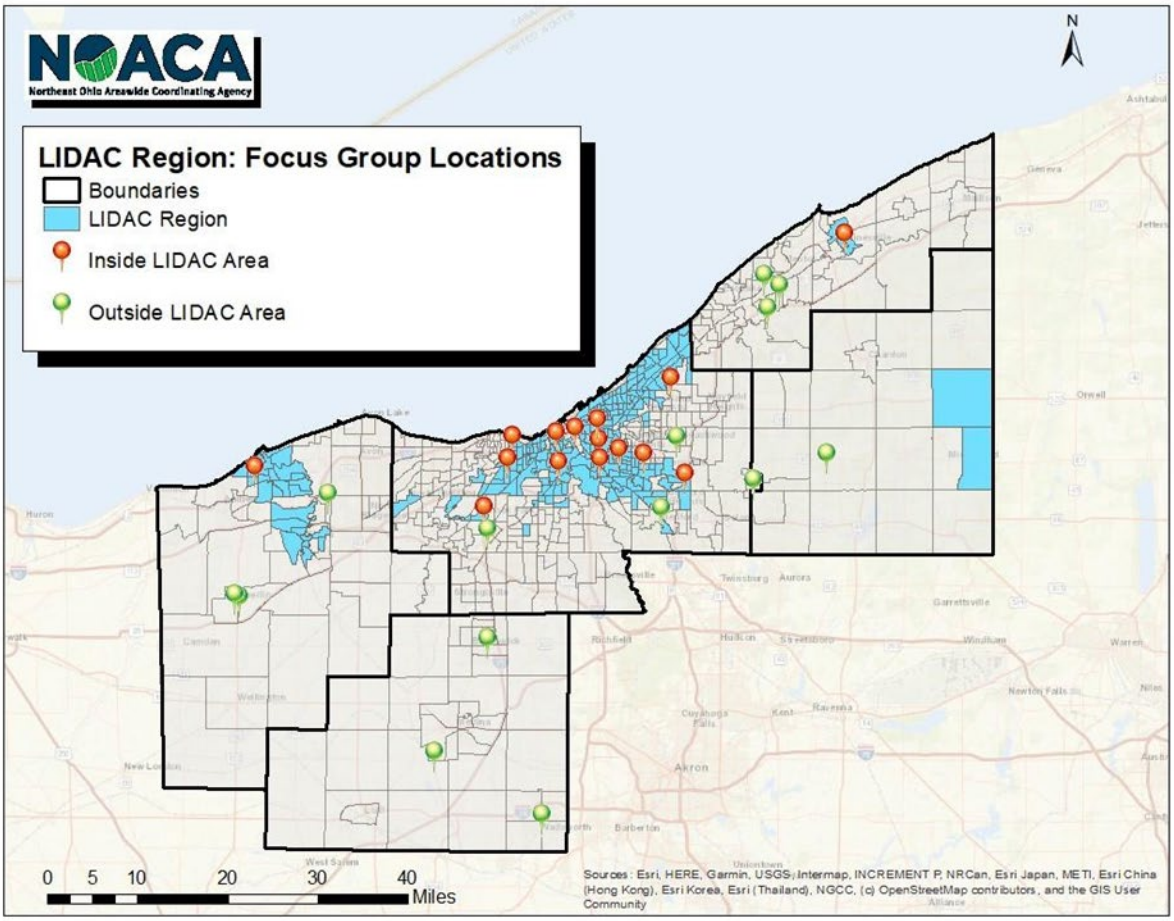


Figure 36. NOACA Focus Group Locations

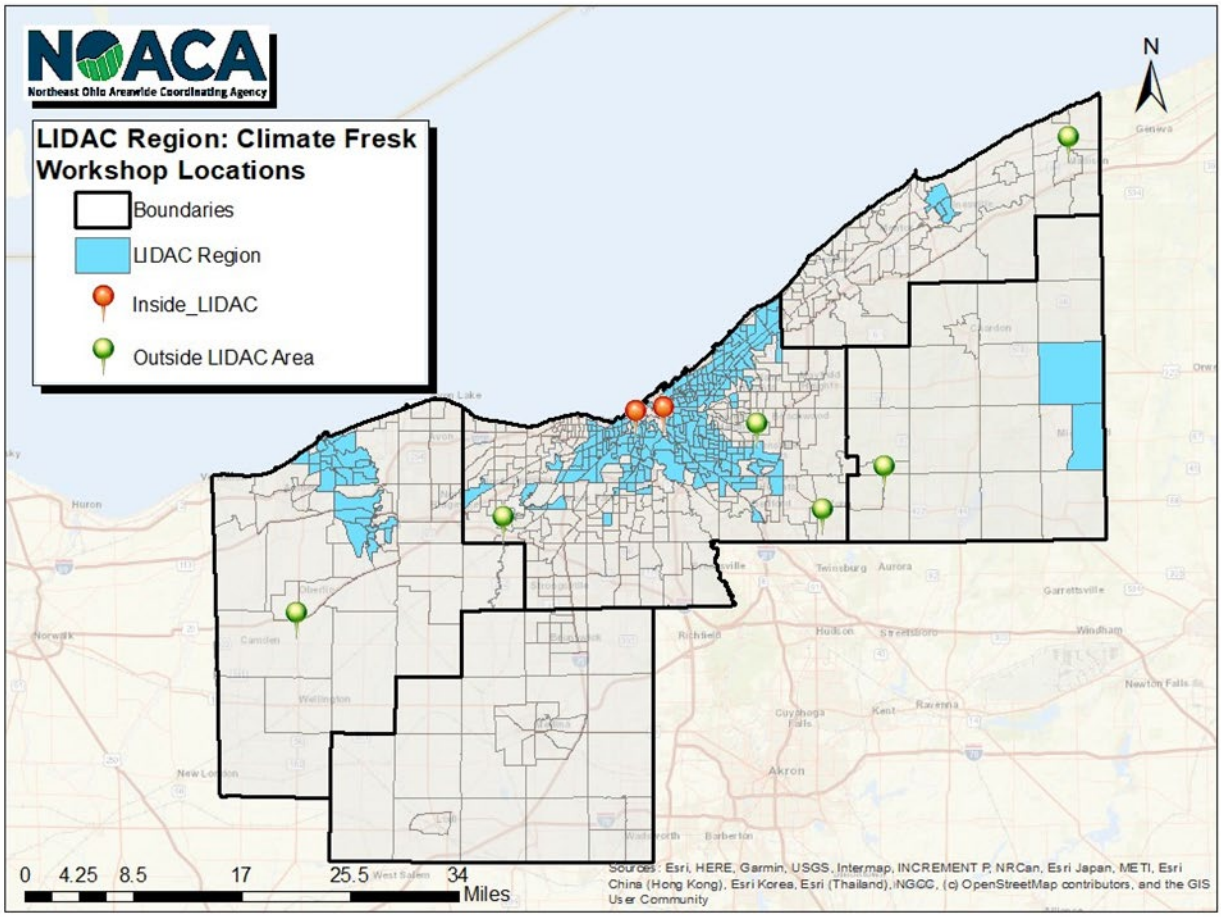


Figure 37. Climate Fresk Workshop Locations

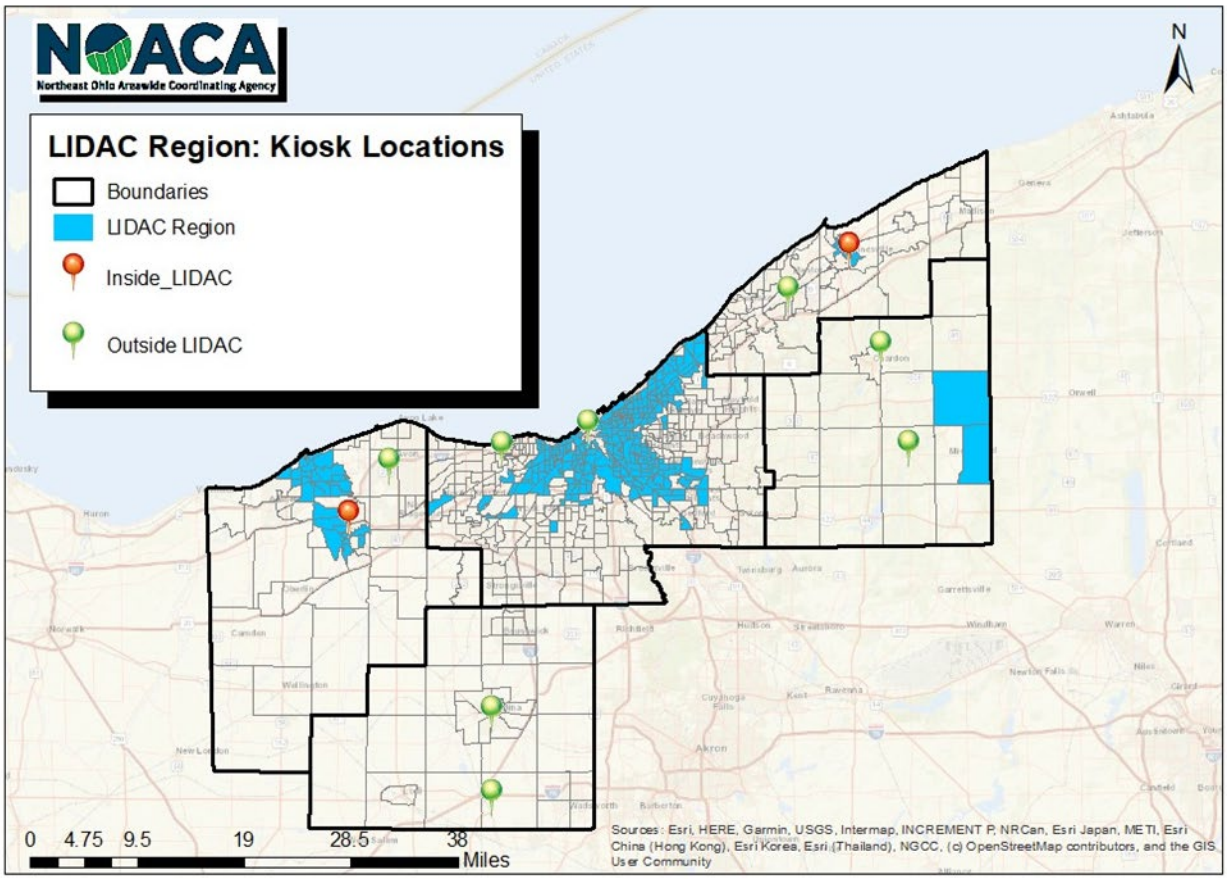


Figure 38. Climate Information Kiosk Locations

Overall, 275 people participated in the 15 focus group sessions that were in and accessible to LIDACs. The 275 individuals who attended a session in a LIDAC represent 39% of the total number of participating individuals. Of these 275 participants, 238 returned a questionnaire. This represents a return rate of 87% at the LIDAC focus groups, which was modestly higher than the overall return rate of 81%. It is not clear why some individuals did not return a form, but staff made every effort to encourage them to do so. In a small number of cases, individuals left the sessions early.

NOACA also intentionally scheduled focus group sessions to make it more feasible for LIDAC stakeholders to participate. For example, four of the sessions in low-income Cleveland neighborhoods occurred after work hours and included refreshments: Bridgeport Place (Central neighborhood), Julia De Burgos (Metro West neighborhood), Riverview Estates, Cleveland Metropolitan Housing Authority (Ohio City neighborhood), and Stella Walsh Rec Center (Slavic Village/Broadway neighborhood). In some of these sessions, attendees brought children. Participants received food to acknowledge their participation. Local community organizers familiar with the area and skilled in outreach helped to promote each focus group session to members of the community.

All LIDAC focus group sessions occurred outside of normal work hours or at a location and time scheduled to be convenient for the targeted group. For example, two sessions occurred during the day for elected officials in First Suburb Communities (inner ring Cleveland suburbs. Of those who participated in these sessions, many represent areas which are either substantially identified as LIDAC or include some LIDAC census tracts (e.g., Cleveland Heights, Euclid, Garfield Heights, etc.).

Each focus group session followed an identical format. As participants entered the meeting room, staff encouraged them to sign in on available sheets; a few participants opted not to sign in, while a few other participants agreed to sign in, but did so anonymously. Participants received a one-page information sheet when they arrived. Each session began with a PowerPoint presentation, followed by distribution of questionnaires.

When focus group sessions were larger, staff broke attendees into smaller groups to participate in conversations with a facilitator/notetaker. Facilitators emphasized respect and participation, and notetakers captured the conversation during each session. The discussion period lasted 35-40 minutes, although there was some variation based on the size of the session and the number of people interested in active participation. Staff worked to include as many people as possible in the conversations. After these breakout discussions, the facilitator concluded the PowerPoint presentation and addressed participant questions.

Participants at the LIDAC sessions expressed a high level of support for the NOACA climate action planning process, and several felt a sense of urgency about climate change. Of the 238 questionnaires returned at LIDAC sessions:

- 230 respondents accepted that the climate was changing, and humans were responsible;
- Eight either questioned whether climate change was occurring; whether human activity impacted it; or whether NOACA should engage in climate action planning; and
- 97% of LIDAC session attendees who completed a survey provided responses supportive of NOACA's effort, higher than the 82% support among all respondents.

Themes of the Focus Group Sessions and Questionnaires

- Unpredictable weather and impacts to our lives: Many participants noted recent erratic thunderstorms and expressed concerns that included both economic and safety concerns. Several expressed concerns about an increase in power outages and the associated implications of unreliable power to homes, businesses, schools, etc.
- Air quality: Many participants talked about the poor air quality during summer 2023 due to the Canadian wildfires. They discussed health impacts that they or their families had experienced, and a large number of participants shared concerns about air quality in the future.
- Changing seasons/impacts on trees and nature/food supply: Participants demonstrated concern about how seasonal changes might affect life in Northeast Ohio. Many mentioned crops or gardens that they tend and shared worries about unexpected seasonal differences. Several wondered what changing seasonal conditions would mean for their lawns and gardens, while others raised concerns about the safety of our food supply.

- Inaction: A number of participants expressed concern that the region and the country are not acting quickly or strongly enough to respond to climate change.
- The future for the next generations: Participants frequently spoke about the implications of climate change for their children/grandchildren and future generations. Many were worried about the viability of their current lifestyle for subsequent generations.
- Concern about minority communities/those left behind: Many session participants expressed strong concern that climate change will exacerbate pre-existing racial and economic inequities. This group requested more focus on those whom they believe are already left behind by society and for whom a changing climate may cause further disadvantage.

Ranked Climate Change Concerns from all Respondents

Question #3 asked respondents to select up to three (out of eight listed) climate change, extreme weather, or air quality/pollution concerns (with an option to provide other concern(s) not listed). The concerns most frequently selected by respondents were:

1. Air Quality Issues/Pollution
2. Extreme Heat
3. Flooding

Priorities Related to GHG emissions by Source

Question #4 asked respondents to consider the top four sources of GHG emissions in the NOACA region: Residential (Energy), Transportation, Industrial Energy, and Commercial (Energy). Question #4 then asked respondents to please rank the sectors, from 1 through 4, with 1 being the most important sector to focus future climate pollution reduction efforts for the region. Staff then averaged the ranked values for each of these sectors and ordered them from highest average rank (lowest average value) to lowest average rank (highest average value):

1. Transportation - 1.84
2. Industrial Energy - 2.34
3. Residential (Energy) - 2.39
4. Commercial (Energy) - 3.19

Strategies to Respond to Climate Change

Questions #5 and #6 asked respondents to identify their top three (i.e., most important) strategies to: (5) reduce the impact of people on the climate (mitigation); and (6) reduce the impact of climate on people (adaptation). Here are the three most frequently provided mitigation strategies by respondents:

1. Renewable Energy
2. Sustainable Transportation
3. Community Engagement

Here are the three most frequently provided adaptation strategies by respondents:

1. Food Supply Protection
2. Infrastructure and Building Design (tie)
3. Forest Protection

Summaries of the Climate Fresks' input and the input received from NOACA's online instrument are available through a PowerPoint presentation shared with the NOACA Board of Directors Policy Committee at their October 13, 2023, meeting (see Appendix C).

Overview of City of Cleveland Public Engagement in LIDAC Areas

The City of Cleveland Mayor's Office of Sustainability (MOS) conducted a community engagement process to kick off the Cleveland CAP and inform the creation of a CRVA. The MOS prioritized intentional and strategic effort to authentically engage residents in historically disinvested communities and adapt to feedback received from residents and partners throughout the process. US EPA categorizes most Cleveland census tracts (89%) as LIDACs, which heightens the importance of feedback from residents in these communities. The MOS used several different strategies to gain input on how Cleveland communities experience climate hazards. The City of Cleveland introduced a public survey and held four in-person public engagement sessions to gain additional input from residents.

Community Engagement Survey

The MOS developed a community survey based on the format of the GCoM and C40 Cities best practices. In response to the survey, participants ranked the likelihood and consequence of climate hazards affecting their neighborhood, the populations, and assets/systems they believe are affected most by different climate hazards, and the factors that might affect their abilities to adapt to hazards. The City of Cleveland translated the survey into Spanish and was able to provide the survey in other languages upon request. The MOS distributed the survey in both physical paper and online formats via a number of networks and communications channels. The survey remained open October 9-November 17, 2023. The MOS received 399 responses, of which 208 came from respondents in 21 LIDACs.

Two survey questions asked participants about the harm and likelihood of specific climate hazards that affect individuals, families, and communities. MOS staff coded the responses as follows: High harm/likelihood = 3; moderate harm/likelihood = 2; low harm/likelihood = 1; do not know = 0. Staff calculated each hazard's risk through the product of all harm scores and all likelihood scores, divided by the number of respondents. The four hazards that pose the biggest risk (i.e., highest risk scores) are:

1. Poor Air Quality
2. Extreme Heat
3. Severe Summer Storms
4. Heavy Precipitation & Flooding

In survey questions 16 and 17 participants had to indicate the populations and systems/assets most vulnerable to each of the climate hazards. Here are the responses for the four hazards that pose the biggest risk:

1. Poor Air Quality

   a. Populations: Outdoor workers, people experiencing homelessness, people with medical conditions and/or disabilities
   b. Systems/Assets: Public health/safety, ecosystems/environmental health, community/cultural
2. Extreme Heat
   a. Populations: Outdoor workers, people experiencing homelessness, people with medical conditions and/or disabilities
   b. Systems/Assets: Ecosystems/environmental health, public health/safety, food, and agriculture
3. Severe Summer Storms
   a. Populations: People experiencing homelessness, outdoor workers, people living in low-income/disinvested communities
   b. Systems/Assets: Ecosystems/environmental health, food and agriculture, public health/safety
4. Heavy Precipitation & Flooding
   a. Populations: People experiencing homelessness, outdoor workers, people living in low-income/disinvested communities
   b. Systems/Assets: Ecosystems/environmental health, food and agriculture, public health/safety

Community Engagement Sessions

The MOS held four public engagement sessions. The survey responses received from community stakeholders informed us of the design of these sessions. Three of the engagement sessions occurred in LIDACs, while the fourth took place Downtown. The MOS scheduled two sessions in areas that had low response rates to the survey, including Union-Miles and Central-Fairfax. The MOS hosted an engagement session Downtown because the neighborhood is at high risk for flood damage. Clark-Fulton is home to a large Hispanic community, and the engagement session enabled the MOS to better incorporate their feedback.

MOS intentionally coordinated with local Community Development Corporations (CDCs) to ensure LIDAC residents could participate in these sessions. Two of these sessions occurred after work hours, while the other two took place at times suggested by the local CDC. Each session included refreshments, and participants had the option to request an all-day transit pass. These sessions occurred at Friendly Inn Settlement House (Central-Fairfax neighborhood), Killingsworth Meeting Place (Union-Miles neighborhood), Bridge City CLE (Clark-Fulton neighborhood), and the Cleveland Public Library Main Branch (Downtown neighborhood), Local community organizers and CDC staff (both familiar with the area and skilled in outreach) helped to promote each session to members of the community. A Spanish interpreter attended the engagement session located in Clark-Fulton. Of the 45 participants who attended these engagement sessions, 25 participants (56% of attendees) lived in LIDAC areas within Cleveland.

Each session followed a similar format and lasted around 90 minutes. After signing in, facilitators encouraged participants to help themselves to refreshments, introduce themselves to their neighbor, and answer an icebreaker question. Each session began with a PowerPoint presentation with an overview of the agenda, an introduction to the concept of climate change,

and descriptions of what climate hazards affect Cleveland. Once the presentation was complete, the facilitator explained each topic of the breakout group and reviewed definitions necessary to discuss the vulnerability of neighborhoods, populations, assets, and systems. When the engagement sessions had more than nine participants, the group split into three breakouts to discuss three different topics: vulnerable neighborhoods, vulnerable populations, and vulnerable assets and systems. Participants received Post-it notes to write their thoughts, and staff encouraged them to give feedback in a way that made them most comfortable. The discussion period for each topic lasted approximately 15 minutes before participants rotated to the next group. After these breakout discussions, the facilitator asked questions about how participants cope with climate hazards and what climate actions are most important to them. When participants had questions or comments that were not directly relevant to the conversation, or that facilitators could not immediately answer, they were encouraged to write them and place them on a “bike rack” (i.e., poster board) to revisit later.

Themes of the Engagement Sessions

OVERARCHING THEMES

- Redlining has caused historic disinvestment in communities, leading to fewer resources and less ability to adapt (older housing stock, public housing stock, low tree canopy).
- Residents feel people do not care, are not engaged, and feel despair.
- There were overall health concerns from exposure to all climate hazards, both direct and indirect.
- The mental health issues that can stem from climate hazards are making health disparities worse, as residents feel anxiety, hopelessness, and resentfulness at having rights taken away.
- Participants expressed concerns about poor infrastructure, abandoned structures, a lack of code enforcement, and the need for the City to maintain better things like sewer drains and roads impacted by flooding, freeze-thaw cycles, etc.
- Climate hazards are causing disruptions to mobility that lead to other harms on assets/systems like the economy.

TOP CLIMATE HAZARDS

- Poor Air Quality
- Extreme Heat
- Heavy Rainfall and Flooding
- Extreme Storms

Feedback on Climate Action Questions

Facilitators asked participants to provide feedback on US EPA’s two priority questions for LIDAC engagement:

Question 1: What potential benefits of climate action are most important to you and members of this community?

Response themes:

- Healthier homes with less mold and basement flooding;
- Better air quality for children, families, elderly people, people who are unhoused, people who have asthma;
- Better water quality and lower water bills; and
- More green spaces and protective trees cover for a cooler environment.

Question 2: What actions should we focus on to reduce climate pollution in Cleveland?

Response themes:

- Electric homes and improvements to old housing stock with no reliable HVAC systems;
- Better public transit and more transit options that increase safety and accessibility;
- Better infrastructure to reduce flooding, make roads safer;
- Tree canopy, native plants, natural lakefront, green space minimums;
- Move out factories and tax manufacturers for polluting to make it unprofitable to pollute;
- Compost food waste;
- Install solar panels on vacant land;
- Expand transit-oriented development; and
- Invest in biking infrastructure.

Overview of Future Public Engagement and Outreach Plans in LIDACs

Effective and meaningful community engagement finds people where they are. This is true both physically and geographically as well as metaphorically and psychologically. This is even more important when targeting LIDACs, because they face additional obstacles and reduced access. This proposed engagement process attempts to acknowledge these physical, cultural, and psychological barriers and to create realistic solutions for genuine LIDAC engagement.

Partners

- In each LIDAC, it will be critical to work with local elected officials whenever possible. In Cuyahoga, Lorain and Lake Counties, many elected officials from LIDACs have already been involved with PCAP development. This provides a basis for further and ongoing engagement with these communities.
- It will be critical to leverage local nonprofits, such as community development corporations (CDCs), and stakeholders that have existing relationships with LIDACs.
- Many LIDACs have various civic and social or social service groups, which can assist in convening residents.

Recommendations

- Ongoing process
    - The City of Cleveland, with the support of partners, including NOACA and Cuyahoga County, will plan to conduct three rounds of engagement within LIDACs throughout the MSA.

        - Each round presents an opportunity to increase understanding of what these communities seek; to build trust; and to further educate and engage residents regarding climate change and opportunities for their communities.
        - The first of these three rounds will build on the PCAP engagements completed in 2023
            - This will be an effort to inform participants about where NOACA and the region are in the process of climate action planning.
            - It will also provide an opportunity to gather information on their general views and concerns.
        - The second round of engagement will focus on a discussion of options and any impacts that residents may experience.
            - The City of Cleveland will build these potential options based on input from the first round and best practices from other regions.
            - The second round of engagement will allow LIDAC participants an opportunity to learn about each of these options and to prioritize which specific actions most interest them.
        - The third round will include distribution of a CCAP draft, with emphasis on actions that account for LIDAC concerns.
            - As the planning process has shifted, this third round of engagement fulfills the previously stated commitment to share an action plan in these disadvantaged communities.
            - This provides a final opportunity for input on the CCAP.
    - Each round of engagement will build on the past and will serve to build and increase trust among LIDAC residents. By completing multiple rounds of engagement in multiple jurisdictions, NOACA and the City of Cleveland will prove their commitment to authentic and ongoing LIDAC engagement.
    - The Cuyahoga County Department of Sustainability will implement a county-wide climate change education campaign to inform residents of regional climate trends and impacts on local infrastructure, natural areas, and human health. The campaign will improve basic climate literacy so that Cuyahoga County residents understand local climate change issues and are better prepared to participate in climate action planning and implementation.
    - Concurrently, the Cuyahoga County Board of Health (CCBH) is collaborating with environmental justice communities to conduct health impact assessments (HIAs) and to use the results of these assessments to mobilize residents to participate in community revitalization projects. Community led interventions are focused on improving air quality, reducing climate impacts, and reducing environmental health disparities.
- Accessible materials (each session will include three elements)
    - A brief presentation that will orient participants to the process and the region's climate action planning efforts as well as share some information about climate change concerns from a scientific perspective, and in a way that is easily understandable.
    - Two pieces of collateral material.

        - A one-page information sheet that participants will have available to them to take home. The information sheet will help educate residents and provide further educational and engagement opportunities.
        - A one-page sheet that allows for participation and input that facilitators can use to quantify various concerns, ideas, and input. Facilitators will collect this second sheet at the end of each engagement session to compile and tabulate quantitative data from LIDAC participants regarding their climate change concerns and action priorities.
    - These written materials will help communicate the various local initiatives related to climate action planning conducted or contemplated by NOACA, the City of Cleveland, or other community stakeholders.
- Diverse team
    - Ensure cultural competency in LIDAC venues and provide translated materials and interpretation services, as appropriate, in locations with large non-English speaking households
- Process and calendar
    - The LIDAC engagement process will begin as soon as PCAP submission (March 1, 2024) and will conclude by spring 2025.
    - In addition to these in-person engagement sessions, each round of engagement can include at least one online engagement session. These digital engagement options should directly complement the in-person sessions. Online options provide homebound residents and others with transportation or schedule challenges with valuable alternatives to in-person engagement.
- Results
    - The depth of this effort and the thoroughness of this process provide a basis for NOACA and the City of Cleveland to meet the federal government's goal that 40% of the overall benefits of the federal investments related to climate change interventions will accrue to LIDACs in the Cleveland-Elyria MSA.

Potential Benefits of Priority GHG Emissions Reduction Measures in LIDACs

The following section qualitatively analyzes the potential benefits of the Priority GHG Reduction Measures to LIDAC areas in the Cleveland-Elyria MSA. For each measure, this section identifies variables or indicators that demonstrate potential co-benefits. These variables or indicators provide a high-level overview of those LIDAC areas that will benefit most from the implementation of these priority measures.

Measure 1: Clean Electricity

US EPA's Power Plants and Neighboring Communities Mapping Tool[88] allows users to determine which disadvantaged communities stand to benefit from a cleaner electricity grid in Northeast Ohio. The tool identifies the 10 operating fuel-burning power plants in the region during 2021 (the most recent year for which data were available) in Table 27.

Table 27. Fuel-Burning Power Plants Operating in Cleveland-Elyria MSA (2021)

Plant Name	County	Primary Fuel	Census Tract	In LIDAC Area?
ArcelorMittal Cleveland, Inc.	Cuyahoga	Coal	39035104800	Yes
Avon Lake Power Plant	Lorain	Coal	39093010400	No
Cleveland Thermal	Cuyahoga	Gas	39035107101	No
Collinwood Bioenergy Facility	Cuyahoga	Biomass	39035117300	Yes
Loraine County Project	Lorain	Biomass	39093060100	No
Oberlin Power Plant	Lorain	Gas	39093060200	No
Painesville Municipal Power Plant	Lake	Coal	39085204302	Yes
Seville Power Plant	Medina	Oil	39103413000	No
Wellington Power Plant	Lorain	Oil	39093096100	No
West Lorain Power Plant	Lorain	Oil	39093097200	Yes

[88] U.S. EPA, "Power Plants and Neighboring Communities Mapping Tool" (retrieved 2.6.2024 from https://experience.arcgis.com/experience/2e3610d731cb4cfcbcec9e2dcb83fc94).

NOACA and the City of Cleveland followed US EPA's guidance and identified all LIDAC Census tracts within a three-mile radius of each power plant.[89] Based on this approach, the following is a list of all LIDAC areas that would benefit from the Clean Electricity measure, after removing duplicate tracts.

39035101200	39035109701	39035114100	39035117400	39035141000
39035102700	39035109801	39035114300	39035117500	39035150100
39035102800	39035110501	39035114501	39035117600	39035150300
39035102900	39035110801	39035114600	39035117700	39035150400
39035103100	39035110901	39035114700	39035117800	39035151100
39035103300	39035111202	39035115100	39035117900	39035151200
39035103400	39035111401	39035115200	39035118101	39035151300
39035103500	39035111500	39035115300	39035118103	39035151400
39035103602	39035111600	39035115400	39035118200	39035151500
39035104200	39035111700	39035116100	39035118301	39035151600
39035104600	39035111902	39035116200	39035118400	39035151700
39035104800	39035112100	39035116300	39035118500	39035151800
39035104900	39035112200	39035116400	39035118602	39035152701
39035105400	39035112301	39035116500	39035118700	39035152702
39035105500	39035112400	39035116700	39035118900	39035196100
39035105602	39035112500	39035116800	39035120200	39035196500
39035106300	39035112600	39035116900	39035120400	39085204200
39035106800	39035112800	39035117101	39035126100	39085204302
39035107802	39035113101	39035117102	39035127501	39085204400

[89] U.S. EPA, "Power Plants and Neighboring Communities: Mapping Power Plants and Neighboring Communities" (retrieved 2.6.2024 from https://www.epa.gov/power-sector/power-plants-and-neighboring-communities).

39035108201	39035113500	39035117201	39035140100	39085204500
39035108301	39035113600	39035117202	39035140301	39093022601
39035108400	39035113801	39035117300	39035140500	39093097200
39035108701				

Measure 2: Building Efficiency and Electrification

Improved energy efficiency and electrification of commercial and residential buildings will provide an array of benefits for disadvantaged communities. It will help communities with aging housing stock through home improvements. It will also assist areas that spend a disproportionate amount of their household income on energy costs. The following lists identify the LIDAC Census tracts likely to benefit from this measure, which are tracts above the 90th percentile for pre-1960s housing and energy cost burden.

- LIDAC Census Tracts at or above the 90th Percentile for Pre-1960s Housing

39035101501	39035111700	39035123601	39035150400
39035102401	39035116700	39035123900	39035151700
39035102700	39035116900	39035140600	39035160100
39035102800	39035117102	39035140702	39035160300
39035103500	39035117300	39035140900	39035161000
39035104800	39035120600	39035141300	39035161200
39035104900	39035120802	39035141400	39035161400
39035106200	39035121100	39035141500	39035183603
39035106300	39035121200	39035141601	39035185201
39035106400	39035121500	39035141602	39035187104
39035111401	39035123200	39035141700	39093023600
39035111600	39035123501	39035150100	

- LIDAC Census Tracts at or above the 90th Percentile for Energy Cost Burden

39035101603	39035111202	39035115200	39035118400	39035122200
39035101700	39035111401	39035115300	39035118500	39035122300
39035101800	39035111500	39035115400	39035118602	39035123800

39035102300	39035111600	39035115700	39035119300	39035127501
39035102401	39035111700	39035115800	39035119402	39035150100
39035102402	39035111800	39035116100	39035119600	39035150300
39035102700	39035111902	39035116200	39035119702	39035150400
39035102800	39035112100	39035116300	39035119800	39035151100
39035102900	39035112200	39035116400	39035119900	39035151200
39035103900	39035112301	39035116500	39035120200	39035151500
39035104600	39035112500	39035116600	39035120400	39035151600
39035104900	39035112600	39035116700	39035120500	39035151700
39035105300	39035112800	39035116800	39035120600	39035151800
39035105400	39035113101	39035116900	39035120701	39035152502
39035105500	39035113500	39035117102	39035120702	39035154300
39035105602	39035113600	39035117202	39035120801	39035196500
39035106800	39035113801	39035117300	39035120802	39093022800
39035108301	39035114100	39035117400	39035121100	39093023000
39035108400	39035114300	39035117500	39035121200	39093023200
39035108701	39035114501	39035117600	39035121300	39093023300
39035109701	39035114600	39035117800	39035121401	39093070500
39035109801	39035114700	39035117900	39035121403	39093070901
39035110501	39035114900	39035118101	39035121500	39093071400
39035110801	39035115100	39035118200	39035121900	39093097300
39035110901				

Measure 3: Green Steel Production

Like Measure 1 (Clean Electricity), there are a limited number of steel-production facilities in Northeast Ohio. The disadvantaged areas that most stand to benefit from decarbonizing steel production are those Census tracts located within a three-mile radius of these facilities. Table 28 identifies these steel-producing facilities.

Table 28. Steel-Producing Facilities Operating in Cleveland-Elyria MSA During 2021[90]

Facility Name	County	Census Tract	In LIDAC Area?
Charter Steel	Cuyahoga	39035196100	Yes
Cleveland-Cliffs Cleveland Works	Cuyahoga	39035110901	Yes
US Steel – Lorain Tubular Operations	Lorain	39093023100	Yes

The following is a list of all LIDAC Census Tracts that would benefit from the Green Steel Production measure, after removal of duplicate tracts.

39035102700	39035105900	39035114501	39035154200
39035102800	39035106300	39035114600	39035154300
39035102900	39035106400	39035114700	39035154501
39035103300	39035106500	39035114900	39035154601
39035103500	39035106600	39035115200	39035196100
39035103602	39035106800	39035115300	39035196500
39035103800	39035106900	39035115400	39093022200
39035103900	39035107802	39035115700	39093023000
39035104100	39035108301	39035115800	39093023200
39035104200	39035109301	39035115900	39093023300
39035104400	39035109701	39035119600	39093023500

[90] U.S. EPA, "Facility Level Information on GreenHouse gases Tool (FLIGHT)" (retrieved from https://ghgdata.epa.gov/ghgp/main.do).

39035104600	39035109801	39035120200	39093023600
39035104800	39035110501	39035120400	39093023700
39035104900	39035110801	39035120500	39093023800
39035105100	39035110901	39035120600	39093023900
39035105300	39035113101	39035121300	39093024000
39035105400	39035113500	39035121401	39093024100
39035105500	39035113801	39035121403	39093097300
39035105602	39035114100	39035127501	39093023100
39035105700	39035114300	39035154100	

Measure 4: Vehicle Miles Traveled (VMT) Reduction

Efforts to reduce VMT come in many forms and can provide an array of benefits. In addition to environmental benefits (e.g., reduced GHG emissions, improved air quality), investments in alternative forms of transportation necessary to reduce VMT can also enhance accessibility and make communities easier and more pleasant to move around on foot or by bike. The following lists identify the LIDAC Census tracts likely to benefit from this measure (i.e., at or above the 90th percentile for zero vehicle households; at or above the 90th percentile for travel barriers; at or below the 10th percentile for walkability or bikeability).

- LIDAC Census Tracts at or above the 90th Percentile for Households without a Vehicle Available

39035101101	39035109301	39035115100	39035119300	39035151500
39035101200	39035109701	39035115200	39035119401	39035151600
39035101300	39035109801	39035115400	39035119402	39035151700
39035101400	39035110501	39035115700	39035119501	39035151800
39035101501	39035110801	39035116100	39035119502	39035152201
39035101700	39035111202	39035116200	39035119600	39035152604
39035101800	39035111401	39035116300	39035119701	39035152701

39035102101	39035111500	39035116400	39035119702	39035154300
39035102402	39035111600	39035116500	39035119800	39035160500
39035102700	39035111700	39035116600	39035119900	39035160602
39035102800	39035111902	39035116700	39035120400	39035161800
39035102900	39035112100	39035116800	39035120701	39035188105
39035103300	39035112200	39035117101	39035120801	39035193900
39035103400	39035112301	39035117102	39035121100	39035196200
39035103602	39035112500	39035117201	39035121200	39035196400
39035104100	39035112600	39035117300	39035121300	39035196500
39035104600	39035112800	39035117500	39035121401	39055311000
39035105400	39035113101	39035117800	39035123502	39055312100
39035105602	39035113500	39035117900	39035133104	39055312300
39035105700	39035113600	39035118400	39035140702	39055312400
39035107701	39035113801	39035118602	39035141000	39085204500
39035107802	39035114100	39035118700	39035150100	39093022400
39035108201	39035114300	39035118800	39035150400	39093070800
39035108301	39035114501	39035118900	39035151200	39093071000
39035108400	39035114700	39035119202	39035151300	39093071400
39035108701	39035114900			

- LIDAC Census Tracts at or above the 90th Percentile for U.S. Department of Transportation Travel Barriers Score

39035109301	39035121500	39055311000	39055312203	39093095100
39035109701	39035121900	39055311300	39085205800	39103409001

39035115100	39035150400	39055311500	39093023900	39103409002
39035119900	39055310200	39055312000	39093070901	39103410000
39035120500	39055310900	39055312100	39093091200	39103411001

- LIDAC Census Tracts at or below the 10th Percentile for Walkability or Bikeability, according to Walkscore

39055312400	39035126100	39035152603
39035154300	39035154700	

Measure 5: Light-Duty Vehicle Electrification

Light-duty vehicle fleet electrification will provide a number of benefits. Individuals who live near heavily-trafficked roads will particularly benefit through improved air quality in their communities. Additionally, because vehicle electrification efforts will require the installation of public EV charging infrastructure, communities that currently lack access to EV chargers will also benefit.

- LIDAC Census Tracts at or above the 90th Percentile for Traffic Proximity and Volume

39035101400	39035105900	39035116200	39035137103
39035101603	39035107701	39035117101	39035154603
39035102402	39035107802	39035117102	39035171104
39035103300	39035108201	39035117202	39035172103
39035103800	39035108301	39035117600	39035172202
39035103900	39035108701	39035119100	39035188106
39035104100	39035109301	39035119202	39035188107
39035104200	39035109701	39035123200	39035192300
39035104400	39035110501	39035123501	39035192800
39035104800	39035110801	39035123800	39035196400

39035105500	39035111401	39035124202	39035980100
39035105602	39035116100	39035133104	

- LIDAC Census Tracts at or below the 10th Percentile for Proximity to EV Charging

39035115100	39055310100	39085204000	39085206300
39035115200	39055310600	39085204200	39093010300
39035115300	39055311000	39085204400	39093023900
39035115400	39055311400	39085204500	39093024000
39035115700	39055311500	39085204800	39093070400
39035115800	39055311700	39085204900	39093070500
39035115900	39055312000	39085205300	39093070600
39035154100	39055312100	39085205701	39093070700
39035177304	39055312400	39085206000	

Measure 6: Heavy-Duty Vehicle Electrification

Heavy-duty vehicle fleet electrification will benefit disadvantaged communities directly. Individuals living in areas with elevated levels of diesel particulate matter will enjoy improved air quality. Communities with high volumes of heavy-duty vehicle traffic will enjoy better air quality and less noise pollution.

- LIDAC Census Tracts at or above the 90th Percentile for Diesel Particulate Matter Exposure

39035104400	39035103900	39035118200
39035104100	39035111700	39035118101

- LIDAC Census Tracts at or above the 90th Percentile for Heavy-Duty Vehicle VMT Per Capita

39035110801	39035188107	39093070300
39035111202	39035196100	39093070400

Measure 7: Refrigerants Capture

While efforts to capture fugitive emissions from refrigerants will help to reduce emissions of potent GHGs and limit the overall amount of climate change the region experiences, these benefits are highly diffuse in nature. As refrigerants do not generate significant co-pollutants, and the benefits of their capture are distributed broadly across the region, it is not possible to identify specific disadvantaged communities that will benefit more from this measure.

Measure 8: Solid Waste Diversion

Actions that divert solid waste from the landfill through measures such as composting and public education campaigns will mitigate harmful methane emissions. These actions will also generate other benefits for disadvantaged communities, including improved air quality (methane contributes to ground-level ozone formation) and reduced noise and air pollution from heavy-duty vehicles in and around landfill sites. LIDACs that will benefit from these actions are home to landfills (Table 29) and those that are near hazardous waste facilities.

Table 29. Landfills Operating in Cleveland-Elyria MSA[91]

Plant Name	County	Census Tract
City of Cleveland – Ridge Road Transfer	Cuyahoga	39035105100
Cleveland-Cliffs Cleveland Works	Cuyahoga	39035110901
Euclid Transfer Station	Cuyahoga	39035152303
Rid-All Green Partnership	Cuyahoga	39035114501
Rumpke Waste Inc., Harvard Road Transfer Facility	Cuyahoga	39035196100
Shaker Heights Transfer Facility	Cuyahoga	39035183603
US Tire Transportation	Cuyahoga	39035110501

[91] Ohio EPA, "Ohio Licensed Solid Waste Facilities" (retrieved 2.6.2024 from https://epa.ohio.gov/static/Portals/34/document/facility_lists/Licensed+SW+-+CDD+facility+list.pdf).

- LIDAC Census Tracts at or above the 90th Percentile for Proximity to Hazardous Waste Sites

39035101102	39035105602	39035112400	39035117500	39035126100
39035101300	39035105700	39035112500	39035117900	39035127501
39035101400	39035105900	39035112600	39035118101	39035150100
39035101501	39035106300	39035112800	39035118200	39035150300
39035101603	39035106800	39035113101	39035118301	39035150400
39035102101	39035106900	39035113500	39035118400	39035151100
39035102102	39035107000	39035113600	39035118500	39035151200
39035102200	39035107101	39035113801	39035118602	39035151400
39035102300	39035107701	39035114100	39035118700	39035151700
39035102401	39035107802	39035114300	39035118800	39035151800
39035102402	39035108201	39035114501	39035118900	39035152603
39035102700	39035108301	39035114600	39035119100	39035154100
39035102800	39035108400	39035114700	39035119202	39035154400
39035102900	39035108701	39035114900	39035119300	39035154700
39035103300	39035109301	39035115100	39035119501	39035160602
39035103500	39035109701	39035115200	39035119502	39035161500
39035103602	39035109801	39035115300	39035120200	39035161600
39035103800	39035110501	39035115400	39035120400	39035161700
39035103900	39035110801	39035115700	39035120500	39035161800
39035104100	39035110901	39035115800	39035121300	39035188104
39035104200	39035111202	39035115900	39035121403	39035188107
39035104300	39035111500	39035116300	39035122100	39035192300

39035104400	39035111600	39035116400	39035122200	39035193800
39035104600	39035111700	39035116500	39035122300	39035196100
39035104800	39035111800	39035116700	39035123200	39035196500
39035104900	39035111902	39035116800	39035123501	39035980100
39035105100	39035112100	39035116900	39035123502	39085204200
39035105300	39035112200	39035117300	39035123900	39093070700
39035105400	39035112301	39035117400	39035124100	39093070800
39035105500				

Measure 9: Nature-Based Solutions

Nature-based solutions to sequester carbon emissions in Northeast Ohio will also provide a number of benefits to disadvantaged communities. An expanded regional tree canopy and green space investments can reduce the urban heat island effect, mitigate stormwater runoff and flooding, improve air quality, and enhance overall quality of life. LIDACs with an elevated flood risk, those with limited forest cover, those with more impervious surfaces, and historically redlined communities particularly stand to benefit from this measure.

- LIDAC Census Tracts at or above the 90th Percentile for Share of Properties at Risk of Flood in 30 Years

39035192900	39035192900	39035192900

- LIDAC Census Tracts at or above the 90th Percentile for Share of Land Area Covered by Impervious Surfaces

39035101400	39035107802	39035110501	39035117202
39035103300	39035108301	39035113101	39035119100
39035104600	39035108400	39035115300	39035161800
39035104800	39035109701	39035115700	39035981100
39035107701	39035109801	39035116700	

- LIDAC Census Tracts that Experienced Historic Underinvestment/Redlining

39035101200	39035109301	39035113600	39035116500	39035119800
39035102102	39035109701	39035113801	39035116900	39035119900
39035102401	39035109801	39035114100	39035117102	39035120400
39035102900	39035110501	39035114300	39035117202	39035120600
39035103100	39035110801	39035114501	39035117300	39035120701
39035103300	39035110901	39035114600	39035117400	39035120802
39035103500	39035111202	39035114700	39035117500	39035121300
39035103602	39035111401	39035114900	39035117800	39035122200
39035103900	39035111500	39035115100	39035118101	39035124600
39035104100	39035111600	39035115200	39035118200	39035127501
39035104200	39035112100	39035115300	39035118301	39035151700
39035104400	39035112301	39035115400	39035118400	39035152501
39035104600	39035112400	39035115700	39035118500	39035161800
39035107802	39035112500	39035115800	39035118602	39035196400
39035108201	39035112600	39035115900	39035118800	39035196500
39035108301	39035112800	39035116100	39035118900	39093023000
39035108400	39035113101	39035116200	39035119202	39093023200
39035108701	39035113500	39035116400	39035119300	39093023600

- LIDAC Census Tracts at or below the 10th Percentile for Forest Cover

39035101101	39035108301	39035116200	39035120200	39035151500
39035101300	39035108400	39035116300	39035120400	39035151600

39035101400	39035108701	39035116400	39035120500	39035151700
39035101501	39035109301	39035116500	39035120600	39035151800
39035101603	39035109701	39035116600	39035120701	39035152202
39035101700	39035109801	39035116700	39035120702	39035152302
39035101800	39035110501	39035116800	39035120801	39035152303
39035101901	39035110801	39035116900	39035120802	39035152400
39035102101	39035111401	39035117101	39035121100	39035152501
39035102200	39035111500	39035117102	39035121200	39035152502
39035102300	39035111600	39035117201	39035121300	39035152603
39035102401	39035111700	39035117202	39035121401	39035152701
39035102402	39035111800	39035117300	39035121403	39035154100
39035102700	39035111902	39035117400	39035121500	39035154300
39035102800	39035112100	39035117500	39035121700	39035154501
39035102900	39035112200	39035117700	39035121800	39035154601
39035103100	39035112301	39035117800	39035121900	39035160602
39035103300	39035112400	39035117900	39035123501	39035161600
39035103400	39035112500	39035118101	39035123502	39035161700
39035103800	39035112600	39035118200	39035123800	39035161800
39035103900	39035112800	39035118301	39035123900	39035171104
39035104100	39035113101	39035118400	39035124100	39035177104
39035104400	39035113500	39035118500	39035124202	39035177202
39035104600	39035113600	39035118602	39035124300	39035183603
39035104800	39035113801	39035118700	39035127501	39035188103
39035104900	39035114100	39035118800	39035140301	39035196400

39035105300	39035114300	39035118900	39035140500	39035196500
39035105500	39035114501	39035119202	39035140701	39085204500
39035105900	39035114600	39035119300	39035140702	39093022200
39035106200	39035114700	39035119402	39035141000	39093022400
39035106400	39035114900	39035119502	39035150100	39093022800
39035106500	39035115100	39035119600	39035150300	39093023200
39035106600	39035115200	39035119701	39035150400	39093023300
39035106800	39035115300	39035119702	39035151100	39093023400
39035106900	39035115400	39035119800	39035151300	39093023500
39035107802	39035115700	39035119900	39035151400	39093071201
39035108201	39035116100			

Measure 10: Agricultural Actions

Mitigation actions in the agricultural sector, which include manure management and conservation agriculture practices, will help to reduce emissions associated with various types of farming, along with air and water pollution reduction and natural environment enhancement in agricultural areas. Disadvantaged communities that have significant agricultural activities that face elevated risks from a changing climate will benefit the most.

- LIDAC Census Tracts at or above the 50th Percentile for Agricultural Loss Rate

39085204400	39035196100	39035154300

3.5 Workforce Planning Analysis

The Cleveland-Elyria MSA CCAP will provide an analysis of workforce development activities needed to implement priority measures included in the PCAP. This analysis will identify skilled labor shortages, impacts on existing jobs and industries, opportunities for the creation of high-quality jobs, and expanded economic opportunity to underserved workers through activities in the plan. This analysis will build on NOACA's recently-completed Comprehensive Economic Development Strategy (CEDS) for Northeast Ohio.

The NOACA CEDS, a strategy-driven plan for regional economic development, leverages the involvement of the public, private, and non-profit sectors to establish a strategic blueprint for regional collaboration.

The Ohio Means Jobs (OMJ) Center indicated there were 95,000 unemployed people at the end of 2020 and noted a mismatch of skills in demand with the education of potential employees. 17,000 entry-level jobs are unfilled in manufacturing, healthcare, and IT.

Impacts on existing jobs and industries can be felt since the size of the labor force was dropping as demand for jobs was increasing in health/education and technology. The OMJ plan calls for more private sector-driven workforce partnership and job matching opportunities.

Opportunities for high-quality job creation exist where local economic development organizations, and private and civic organizations identify key innovation clusters. Worker demand in skilled and technology jobs must be filled from within the region. There is a need to focus on workforce training, education, pipelines, and workforce support to fill needed jobs and support distressed and disadvantaged communities.

Workforce development is a common need to make development occur in the five-county Northeast Ohio region. Please see Table 30 for the goals, strategies, outcomes, and potential partners to develop Northeast Ohio’s workforce.

Table 30. Northeast Ohio Workforce Development (Goals, Strategies, Outcomes, Partners)

Goals: Vibrant, Innovative Economy / Premier Partnerships / Growing Population and Skilled Workforce

Strategies	Outcomes	Potential Partners
Support regional industry cluster work groups	Closer coordination among industry sectors; More competitive industry clusters in the larger economy	Chambers of Commerce; Economic Development Agencies; Labor Leadership; OMJ; Industry Sector Partnerships; Workforce Development Organizations
Coordinate community and economic development strategies with workforce needs	A workforce with the skills needed to sustain the regional economy	Chambers of Commerce; Economic Development Agencies; Labor Leadership; OMJ; Industry Sector Partnerships; Workforce Development Organizations
Work with partners to support the educational needs of the workforce	Workforce advancement through upskilling into opportunities in the Region	Community Colleges and Universities; Trade schools; High Schools; Labor Leadership, OMJ, Industry Sector Partnerships, Workforce Development Organizations
Create programs for older or retired workers to mentor business associations, employers	Retain more workers and transfer skills and work habits needed in the workplace	High Schools; Community Colleges and Universities; Trade Associations, OMJ, Workforce Development Organizations
Identify communities of need and focus services to them to increase labor participation	Upgraded skills for access to available jobs	Business Associations, Employers; High Schools; Community Colleges and Universities; Trade Associations, OMJ, Workforce Development Organizations
Support and create STEM hubs in K-12 systems	More workers trained in occupations needed for business growth	Business Associations, Employers; High Schools; Community Colleges and Universities; Trade Associations, OMJ, Workforce Development Organizations
Support training and reentry of formerly incarcerated individuals into the workforce	Higher labor force participation and lower recidivism	Office of Workforce Development; Ohio Department of Rehabilitation and Correction; Industry Leadership; Education Leadership, OMJ, Workforce Development Organizations
Start young and create paid internships and work experiences while students are in school	More workers trained in occupations and work habits needed in the workplace	Business Associations; Employers; High Schools; Community Colleges and Universities; Trade Associations; Workforce Development Organizations; MAGNET; OMJ; Workforce Development Organizations
Coordinate with neighboring areas that are part of a larger labor shed	Additional jobs and skilled labor supply opportunities in a larger catchment area	Ohio Office of Workforce Development; Neighboring EDDs; OMJ; Workforce Development Organizations

4 Next Steps

NOACA and the City of Cleveland will focus the month of March on preparation of potential CPRG Phase II Implementation Grant proposals, as well as provide support to other entities in the region who intend to submit applications for Phase II support. Following the April 1 deadline for such proposals, both NOACA and the City of Cleveland will redirect their focus to CCAP development. The CCPA will include the following elements:

Greenhouse Gas (GHG) Inventory: Though NOACA prepared a regional GHG inventory for the PCAP, the baseline year was 2018 and newer data is now available. Both NOACA and the City of Cleveland agree that it may make sense to revisit the inventory and prepare a new inventory with a 2022 baseline year. The updated, comprehensive inventory will include all emissions and sinks by source and sink category following commonly accepted protocols for the following sectors: industry, electricity generation/use, transportation, commercial and residential buildings, agriculture, natural and working lands, and waste and materials management. NOACA and the City of Cleveland shall address GHG emission sources and sinks across the entire geographic scope of the Cleveland-Elyria MSA.

GHG Emissions Projections: The PCAP includes both near-term (2030) and long-term (2050) sector-based projections of GHG emissions under a “business-as-usual” scenario. The PCAP also projections of emission reductions through the implementation of each priority measure. However, the CCAP will need to include revised business-as-usual scenario projections based on a new GHG emissions inventory with a 2022 baseline year. The CCAP will also include projections for a “full plan implementation scenario.”

GHG Reduction Targets: NOACA and the City of Cleveland must develop economy-wide, near-term (2030) and long-term (2050) GHG emission reduction targets (on a gross or net GHG emission basis). NOACA has done some preliminary work in this area back in 2022, as has the City of Cleveland through its own climate action plans. NOACA and the City of Cleveland will collaborate with stakeholders to ensure that Cleveland-Elyria MSA targets are consistent with the United States’ formal commitments to reduce emissions 50-52% relative to 2005 levels by 2030 and to reach net-zero emissions by 2050. NOACA and the City of Cleveland will also strongly consider sector-based emission reduction targets, especially for the highest priority sectors most targeted by emission reduction measures.

GHG Reduction Measures: The PCAP includes a full suite of implementation measures and projections of their impacts on emission reductions. However, NOACA and the City of Cleveland must update these measures for the CCAP, so the measures meet the newly-established GHG reduction targets. The CCAP measures will address the main GHG emission sectors: industry, electricity generation/use, transportation, commercial and residential buildings, industry, agriculture, natural and working lands, and waste and materials management. Like the PCAP, for each measure, the CCAP will identify the quantifiable GHG emissions reductions (or enhancement of carbon sinks), key implementing agency or agencies, implementation schedule and milestones, expected geographic location if applicable, milestones to obtain implementation authority as appropriate, identification of funding sources if relevant, and metrics to track

progress. NOACA and the City of Cleveland will also include quantifiable cost information for each measure in the CCAP.

Benefits Analysis: NOACA and the City of Cleveland will assess benefits of GHG reduction measures across the entire MSA for the CCAP. Their analysis will include both base year estimates of co-pollutants (including criteria pollutants/precursors and air toxics) and anticipated co-pollutant emission reductions from plan measure implementation to meet GHG reduction goals. NOACA and the City of Cleveland will quantify estimates of co-pollutant reductions associated with GHG reduction measures. They will also track, minimize, and mitigate, to the extent possible, any potential disbenefits that result from plan measure implementation. NOACA and the City of Cleveland will also investigate a broader assessment of benefits associated with their GHG reduction measures including, but not limited to, analysis of air quality improvements (e.g., criteria air pollution and air toxics), improved public health outcomes, economic benefits, increased climate resilience, and other environmental benefits.

Low Income Disadvantaged Communities (LIDACs) Benefits Analysis: NOACA and the City of Cleveland identified LIDACs, recapped preliminary engagement of LIDAC stakeholders and provided a qualitative assessment of the impact of GHG reduction measures on LIDACs in the PCAP. However, the CCAP will include a quantitative analysis of the extent to which any GHG reduction measures will deliver co-pollutant emissions reductions and other benefits to LIDACs. NOACA and the City of Cleveland will also greatly expand on their engagement efforts in LIDACs, with focused guidance from LIDAC representatives who know best how to reach the most critical audiences in their jurisdictions. This expanded engagement is critical to ultimate buy-in from LIDAC stakeholders and a sense of ownership and optimism about their future in a world reshaped by climate change.

Review of Authority to Implement: As with the PCAP, NOACA and the City of Cleveland will indicate whether they have existing statutory or regulatory authority to implement each GHG reduction measure, or whether they must still obtain such authority. The CCAP will include a schedule of milestones for actions needed by key entities (e.g., legislature, administrative agency, etc.) to obtain any authority needed to implement each listed program or measure.

Intersection with Other Funding Availability: NOACA and the City of Cleveland will expand upon their initial identification of plan measure funding programs in the PCAP. This will include funding programs either available or secured from federal, state, local and private sources that could be leveraged to pursue CCAP objectives around the GHG reduction measures.

Workforce Planning Analysis: NOACA and the City of Cleveland will conduct an analysis of anticipated workforce shortages that could prevent them from achieving CCAP goals. They will also identify potential solutions and partners at the state, regional, and local levels that are equipped to help address those challenges. NOACA and the City of Cleveland will build upon the work of the recently completed Comprehensive Economic Development Strategy (CEDS) for Northeast Ohio and discuss workforce development priorities in accordance with GHG reduction measures. NOACA and the City of Cleveland will probe how activities or policies will lead to the creation of high-quality jobs in alignment with the U.S. Department of Labor’s Good Jobs Principles.