Oakland County Vulnerability Assessment

July 24th, 2025

CLC Fellow: JEEWON SUH

OAKLAND COUNTY MICHIGAN
OFFICE OF SUSTAINABILITY

GRAHAM SUSTAINABILITY INSTITUTE
CENTER FOR EMPOWERING COMMUNITIES
UNIVERSITY OF MICHIGAN

TEAM INFO.

CLC Fellow
Jeewon Suh
Master of Urban and Regional Planning,
Taubman College, University of Michigan

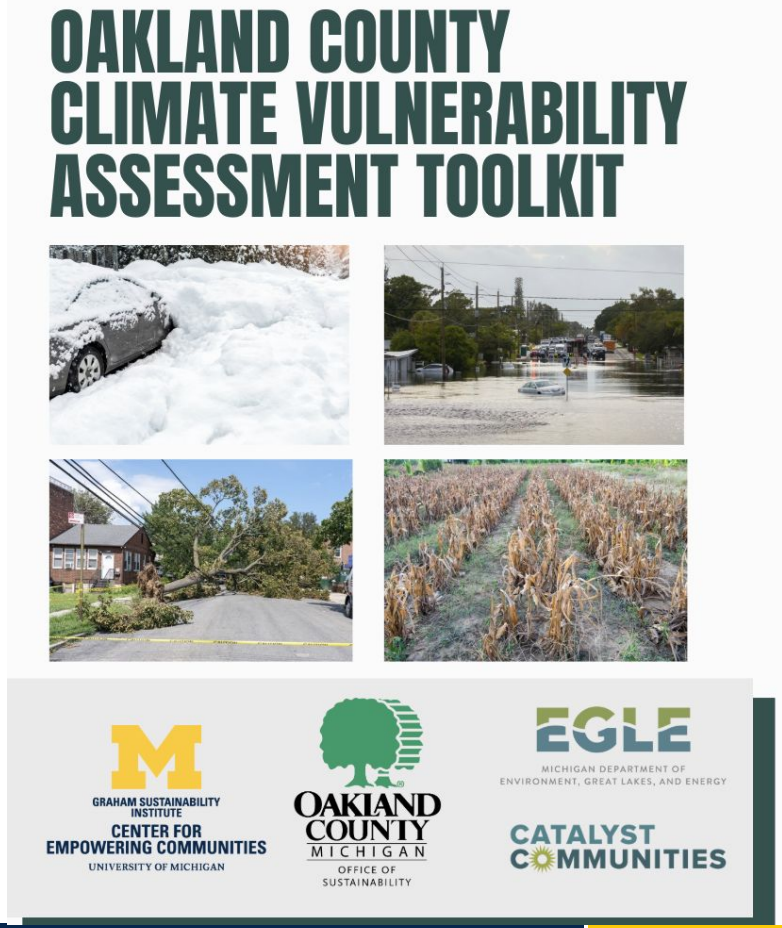
Mentor
Nicole Card
Oakland County sustainability Specialist,

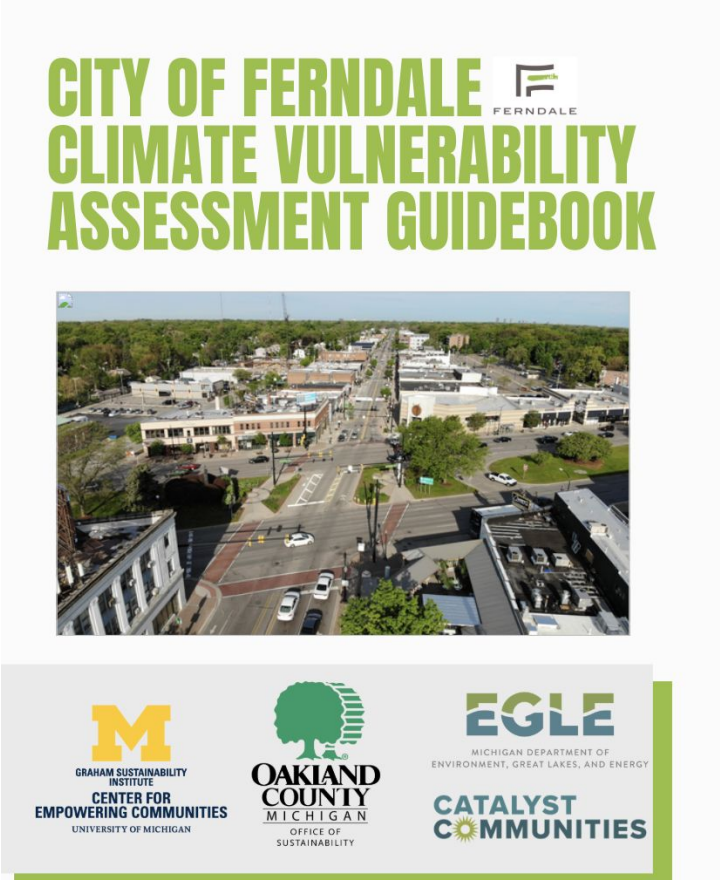
Technical Assistant
Kim Channell
GLISA Senior Climatologist

Deliverables.

What is the Toolkit?

- Practical guide for small municipalities assess climate risks and plan equitable adaptation strategy
- Editable, customizable PDF Toolkit
- Supports data-driven, equitable climate planning



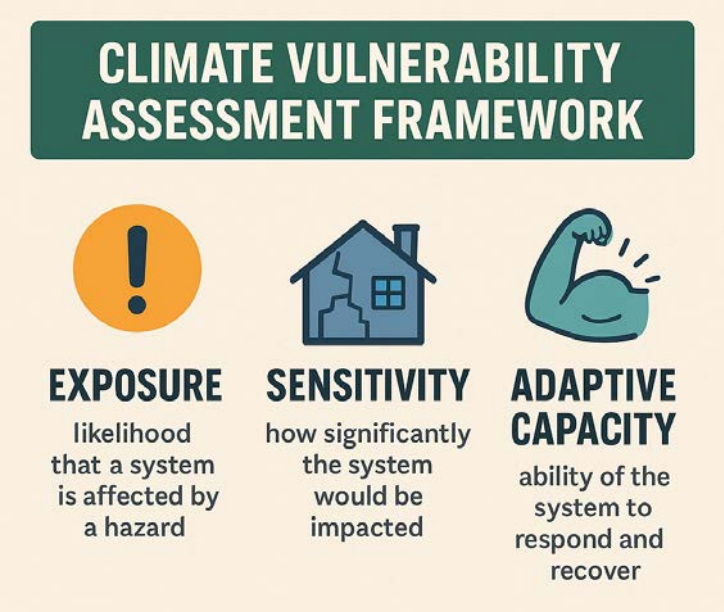


Deliverables.

City of Ferndale Climate Vulnerability Assessment Guidebook

- Developed a sample assessment using the City of Ferndale as an example.
- Selected climate risk as heat and inland flooding to show the steps.
- Collected all data sources used (GLISA, MiEJScreen, SEMCOG).

What is a Climate Vulnerability Assessment?



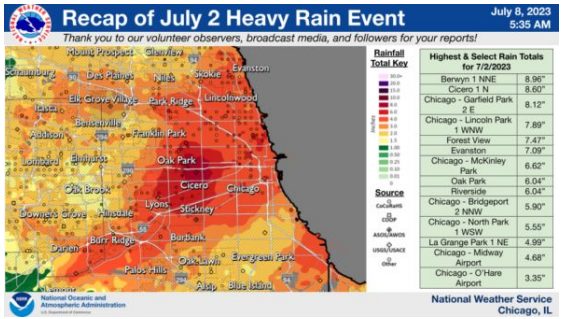
- Strategic tool to evaluate **risks** from climate change
- Focuses on **exposure, sensitivity, and adaptive capacity** (IPCC framework)
  - **Exposure**: The extent to which a system is likely to experience a specific climate hazard.
  - **Sensitivity**: The degree to which the system will be affected if exposed.
  - **Adaptive Capacity**: The system's ability to prepare for, respond to, and recover from impacts.
- This assessment **Supports** local planning and decision-making

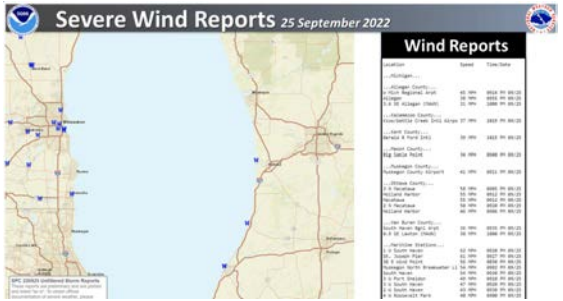
Why do local municipalities need this Toolkit?

Source: City of Ferndale Website

- Identifying local risks
- Supporting data-driven decision making
- Enabling long-term monitoring and adaptive learning
- Guide communities with limited GIS or climate planning capacity

Climate Change in Great Lake Region





Source: GLISA / NOAA

Climate Vulnerability Assessment: 6 Steps.

01 Understanding Types of Climate Hazards

02 Screening and Selecting Priority Hazards

03 Identifying Community Systems and Vulnerable Assets

04 Assessing Vulnerability Through Hazard-System Pairing

05 Creating a Risk Prioritization Matrix

06 Synthesizing Results and Planning Next Steps

STEP 1. Understanding Types of Climate Hazards

- Common hazards include:

  Extreme heat

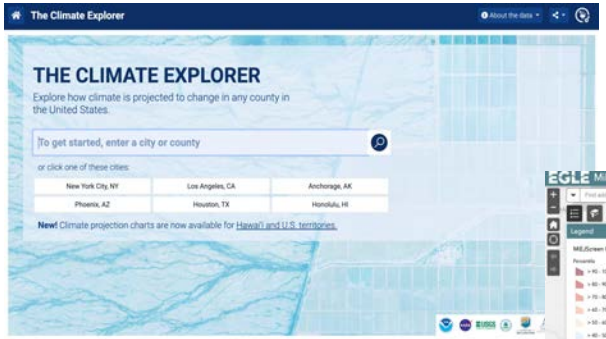
  Inland flooding

  Air quality degradation

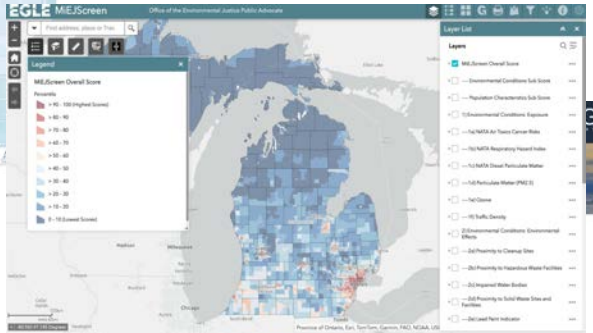
  Snowstorms and wind events

STEP 2. Screening and Selecting Priority Hazards

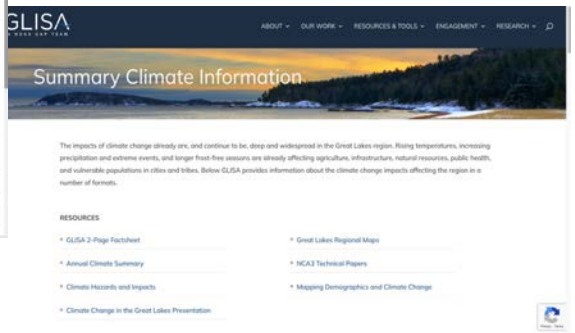
- Use national and regional data (NOAA, MiEJScreen, GLISA) to identify climate hazards.



NOAA, The Climate Explorer



Michigan Environmental Justice Screen

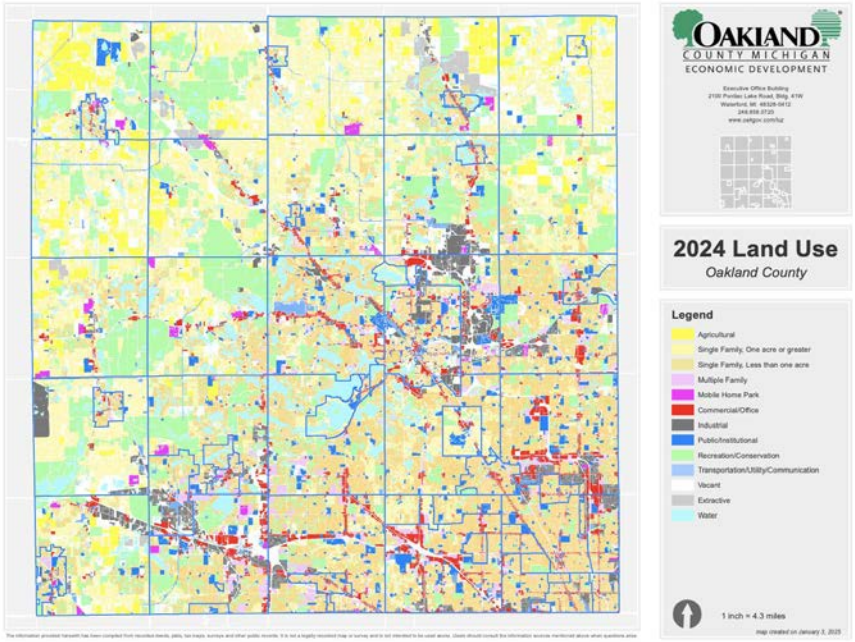


GLISA, Summary Climate Information

STEP 3a. Identifying Community Systems and Vulnerable Assets

BUILT ENVIRONMENT & INFRASTRUCTURE

- ❑ Stormwater infrastructure age and capacity
- ❑ Road networks and major transit corridors
- ❑ Location of critical facilities (hospitals, fire stations, shelters)
- ❑ Housing stock age, type, and condition
- ❑ Land use and zoning maps
- ❑ Impervious surface area / green space ratio
- ❑ Tree canopy coverage

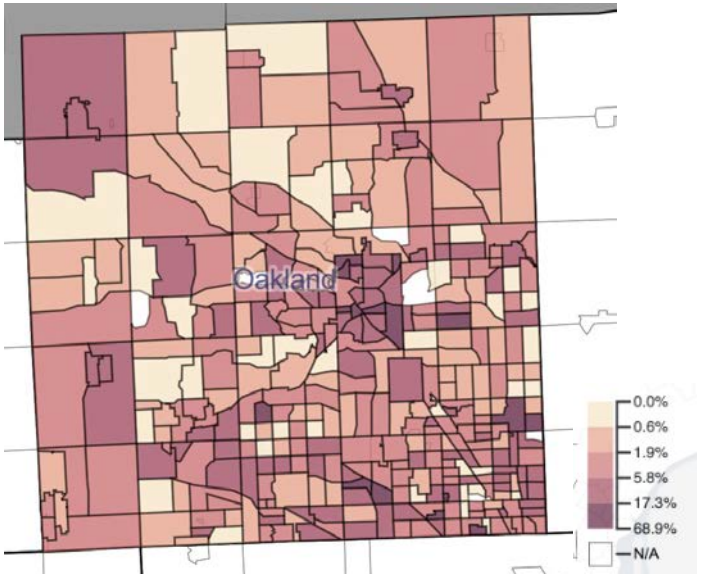


Land Use and Zoning Maps, Oakland County

STEP 3b. Identifying Community Systems and Vulnerable Assets

DEMOGRAPHIC & PUBLIC HEALTH

- ❑ Population density by census tract or block group
- ❑ Age-based vulnerability
- ❑ Households below the poverty line
- ❑ Renters vs. homeowners
- ❑ % non-white population
- ❑ % limited English proficiency
- ❑ Disability status
- ❑ Uninsured population
- ❑ Health indicators (asthma, heart disease, low birth weight)

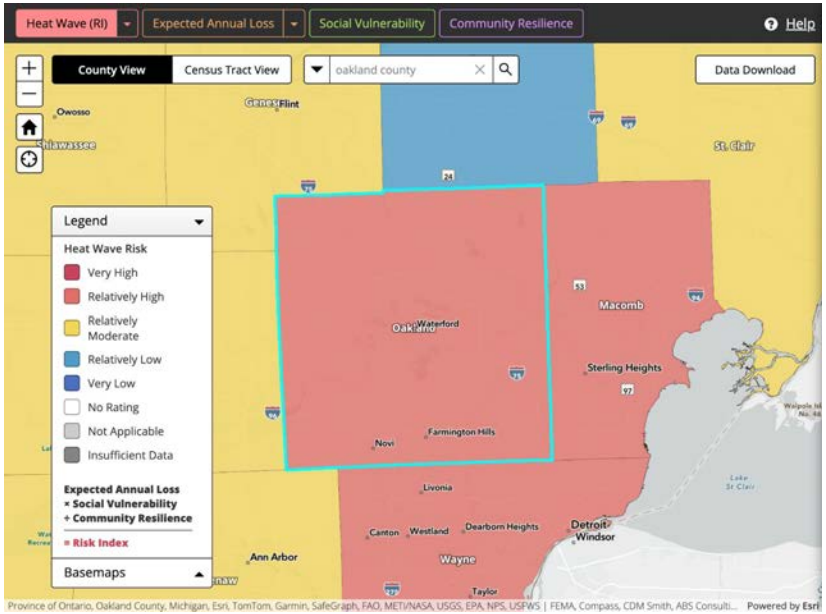


Percent Household with No Car, SEMCOG Community Explorer

STEP 3c. Identifying Community Systems and Vulnerable Assets

ENVIRONMENTAL HAZARD EXPOSURE

- ❑ Floodplain maps
- ❑ Urban Heat Island (UHI) data
- ❑ Historical flood incident reports
- ❑ Extreme heat and air quality events
- ❑ Tree canopy deficiency zones
- ❑ Proximity to pollution sources (TRI sites, highways, industrial facilities)

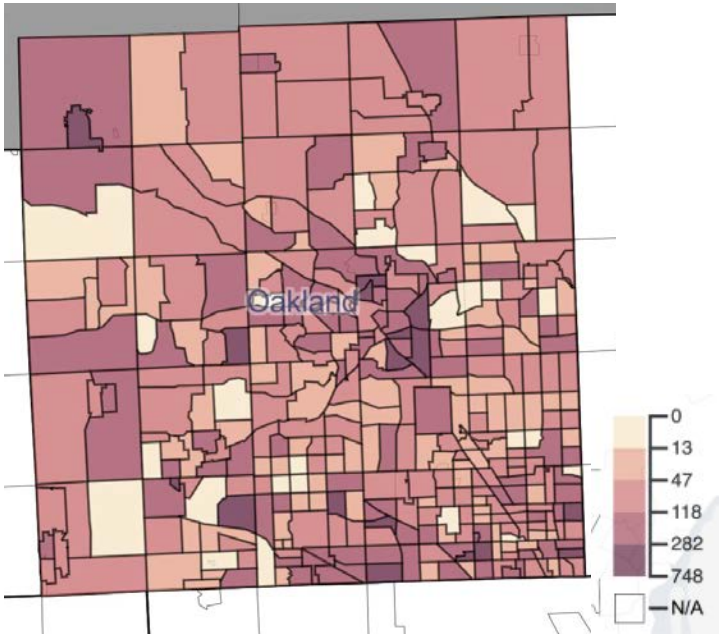


Oakland County Heat Wave Risk Map, FEMA National Risk Index

STEP 3d. Identifying Community Systems and Vulnerable Assets

COMMUNITY RESOURCES

- ❑ Location of community centers and cooling centers
- ❑ Emergency shelter locations
- ❑ Public transit accessibility
- ❑ Broadband internet access
- ❑ Access to healthcare services
- ❑ Presence of neighborhood organizations or mutual aid groups

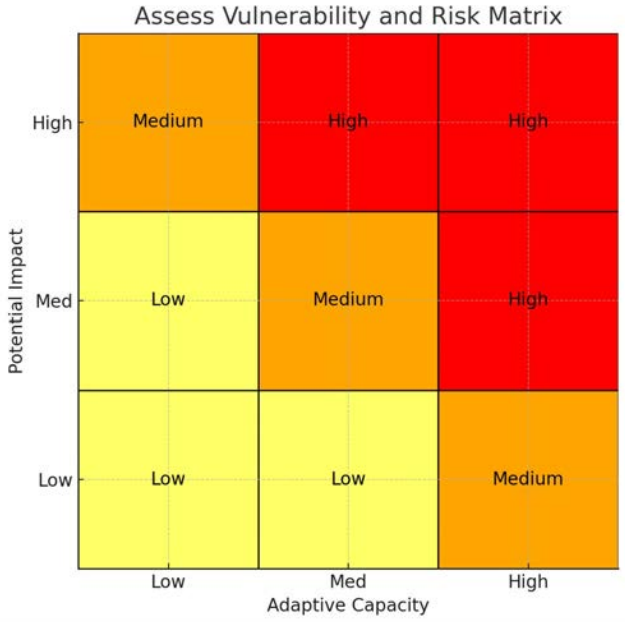


Total Households without Broadband Internet Access, SEMCOG Community Explorer

STEP 4. Assessing Vulnerability Through Hazard-System Pairing

Component	Description
Pairing	Public Health – Extreme Heat
Impact	Prolonged heatwaves increase risk of heat exhaustion and heat stroke, particularly among older adults, outdoor workers, and low-income households without access to air conditioning.
Adaptive Measure	Expand and promote access to public cooling centers; provide transportation vouchers for vulnerable residents; develop a summer heat emergency response plan.
Co-Benefits	Improves community well-being, strengthens social service networks, and reduces emergency medical calls.
Needs	Funding for extended facility hours and transportation; coordination with senior centers, local transit, and health departments; multilingual outreach and communications.

STEP 5. Creating a Risk Prioritization Matrix



- Visualizes vulnerability by plotting Impact **(Exposure × Sensitivity)** against Adaptive Capacity
- Highlights high-priority hazard–system pairings for targeted action
- Supports clear decision-making for resource allocation and planning

STEP 6. Synthesizing Results and Planning Next Steps

- Short-Term, Low-Cost Actions
- Long-Term Investment Strategies
- Equity-Based Strategies

- Funding and Resource Identification
- Monitoring and Adaptive Management
- Partnerships and Collaboration

Q&A

2 minutes

Thank you!

jiwonsuh@umich.edu

CATALYST COMMUNITIES

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY