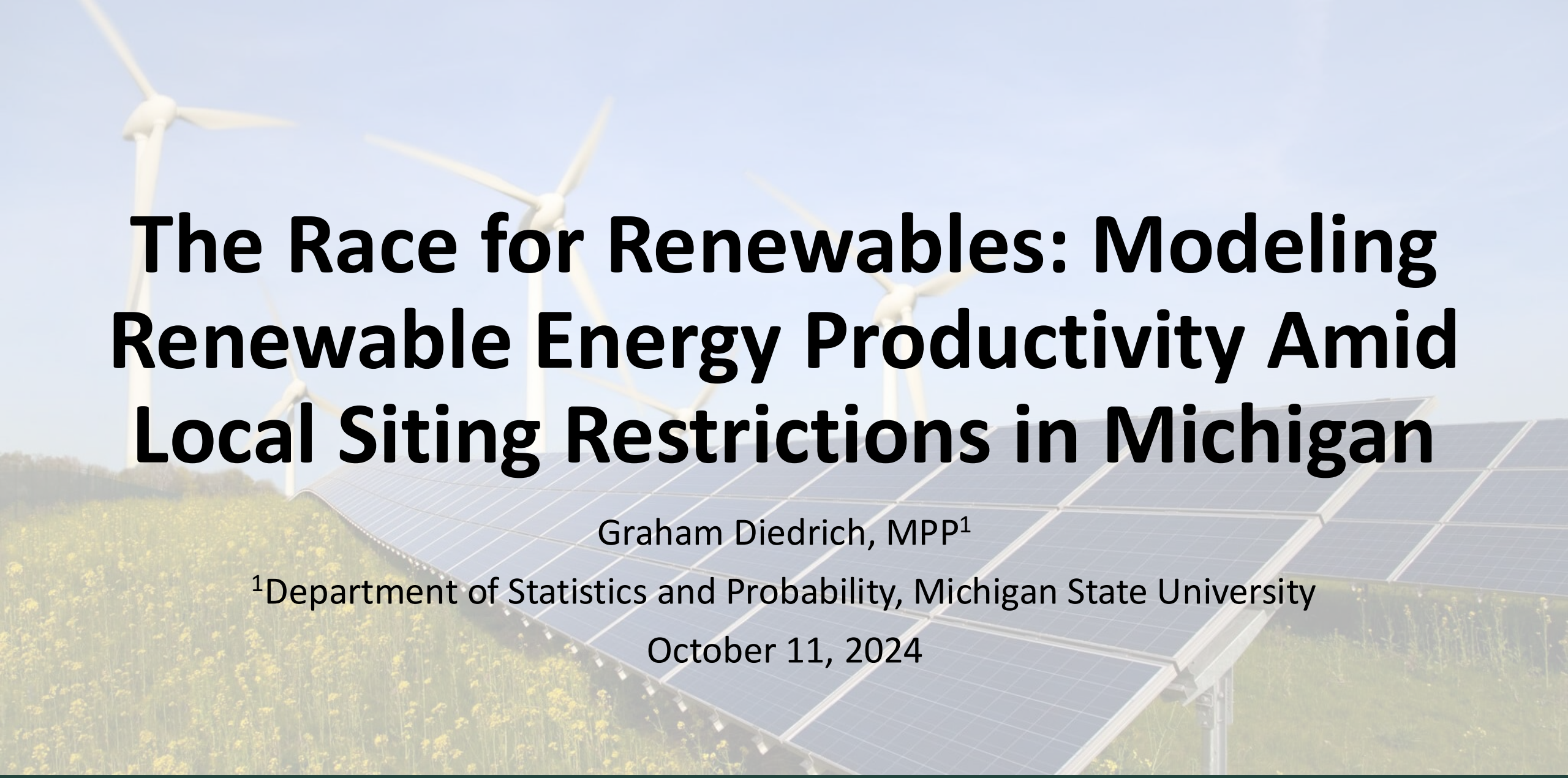

The Race for Renewables: Modeling Renewable Energy Productivity Amid Local Siting Restrictions in Michigan

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October 11, 2024

Environmental Science & Policy Program
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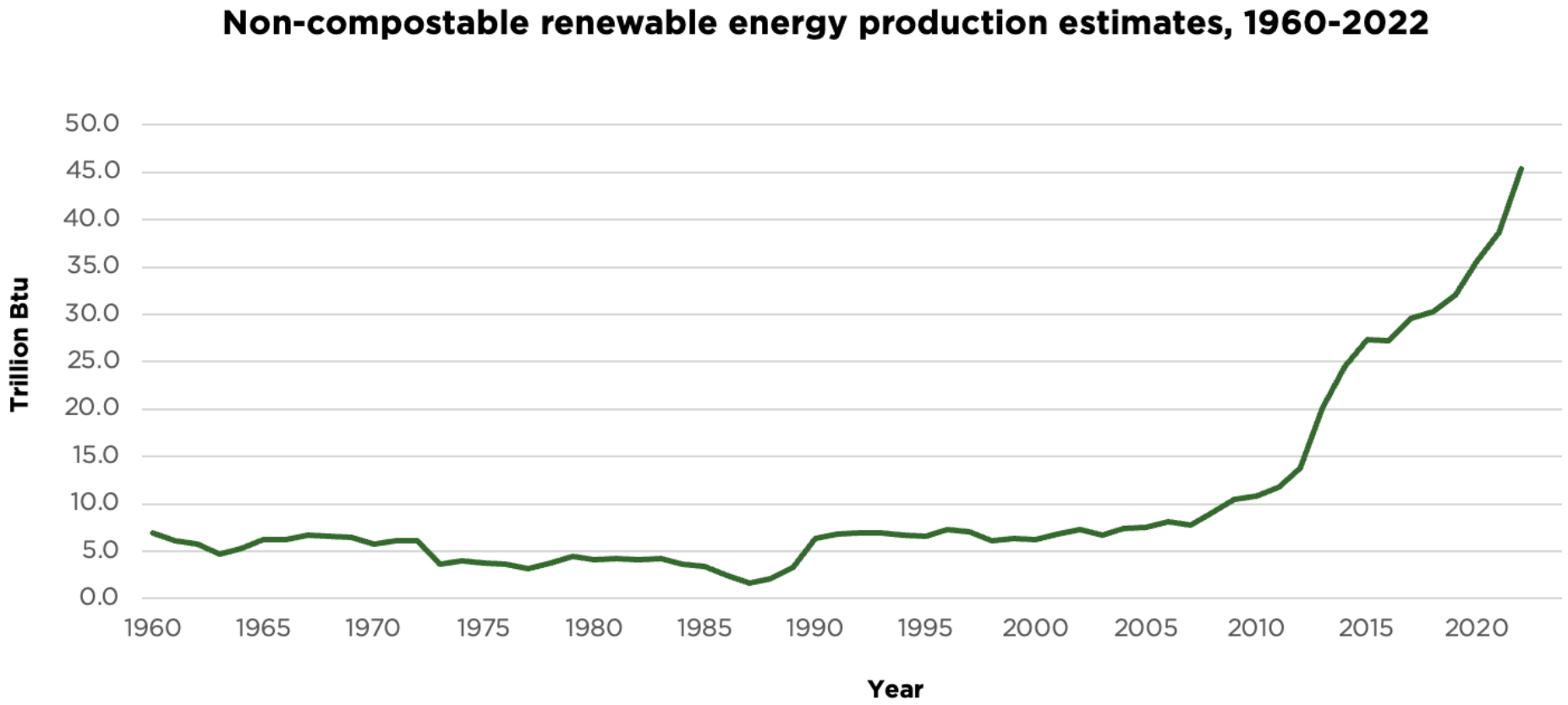
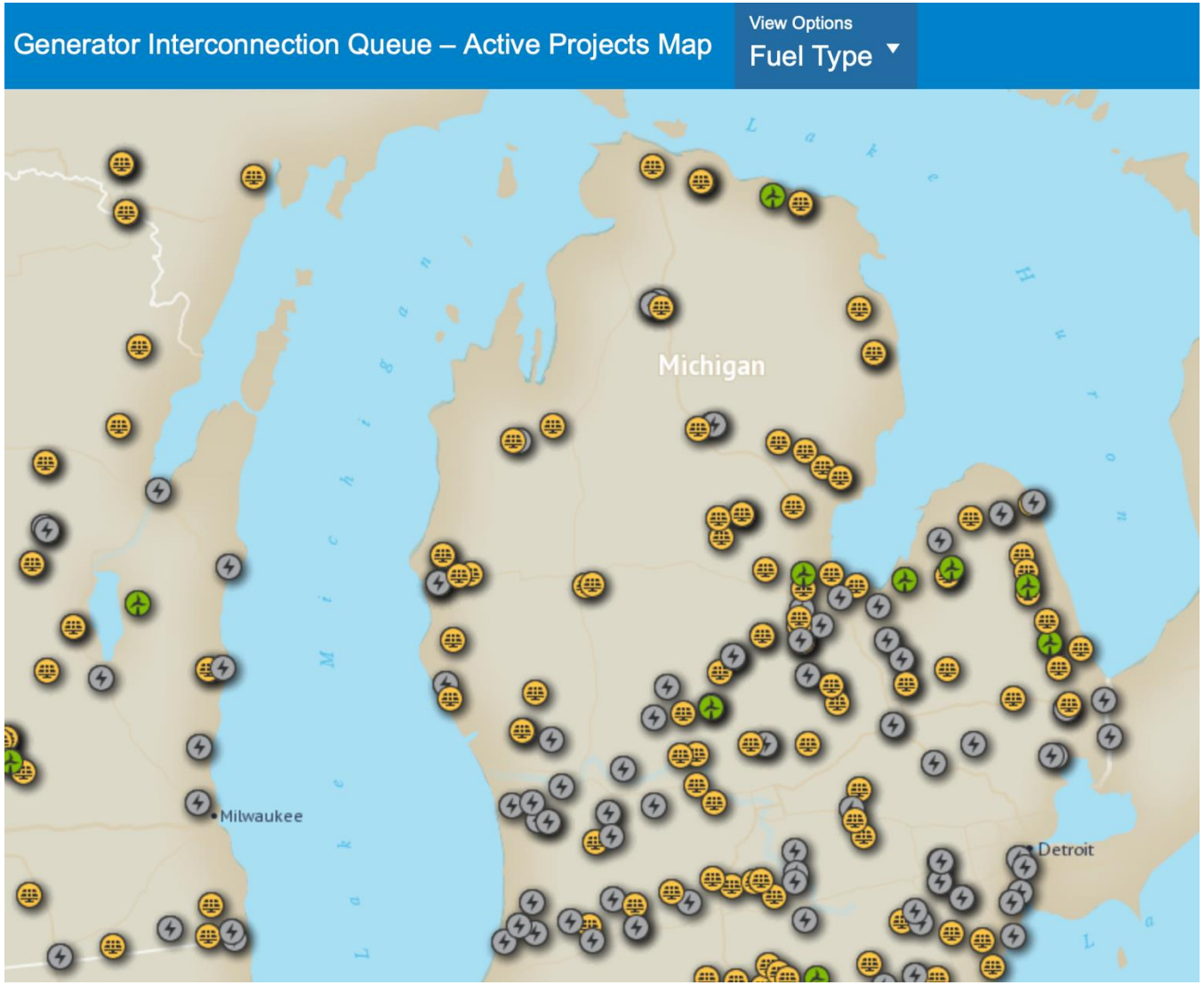
This research is supported by the Michigan State University Environmental Science and Policy (ESPP) Competitive Research Grant (CRG).

Context

Solar and wind is growing rapidly…



Source: EIA

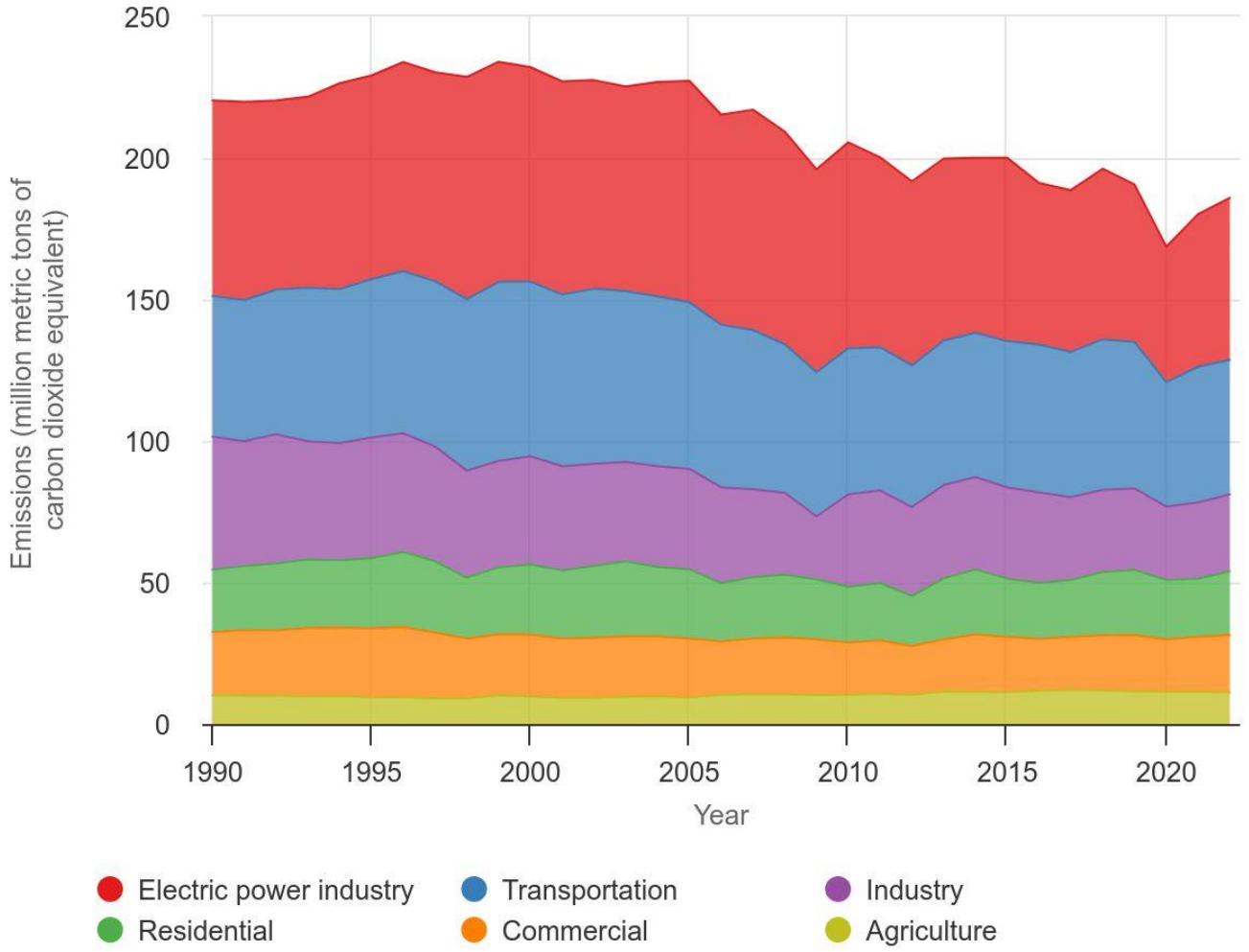


Source: MISO

Large delay between project start and interconnection!

- Over 200 GW of generator and storage capacity waiting for connection
- 82% of projects are wind, solar, or battery storage

Michigan Greenhouse Gas Emissions by Economic Sector, 1990–2022



Percent change:

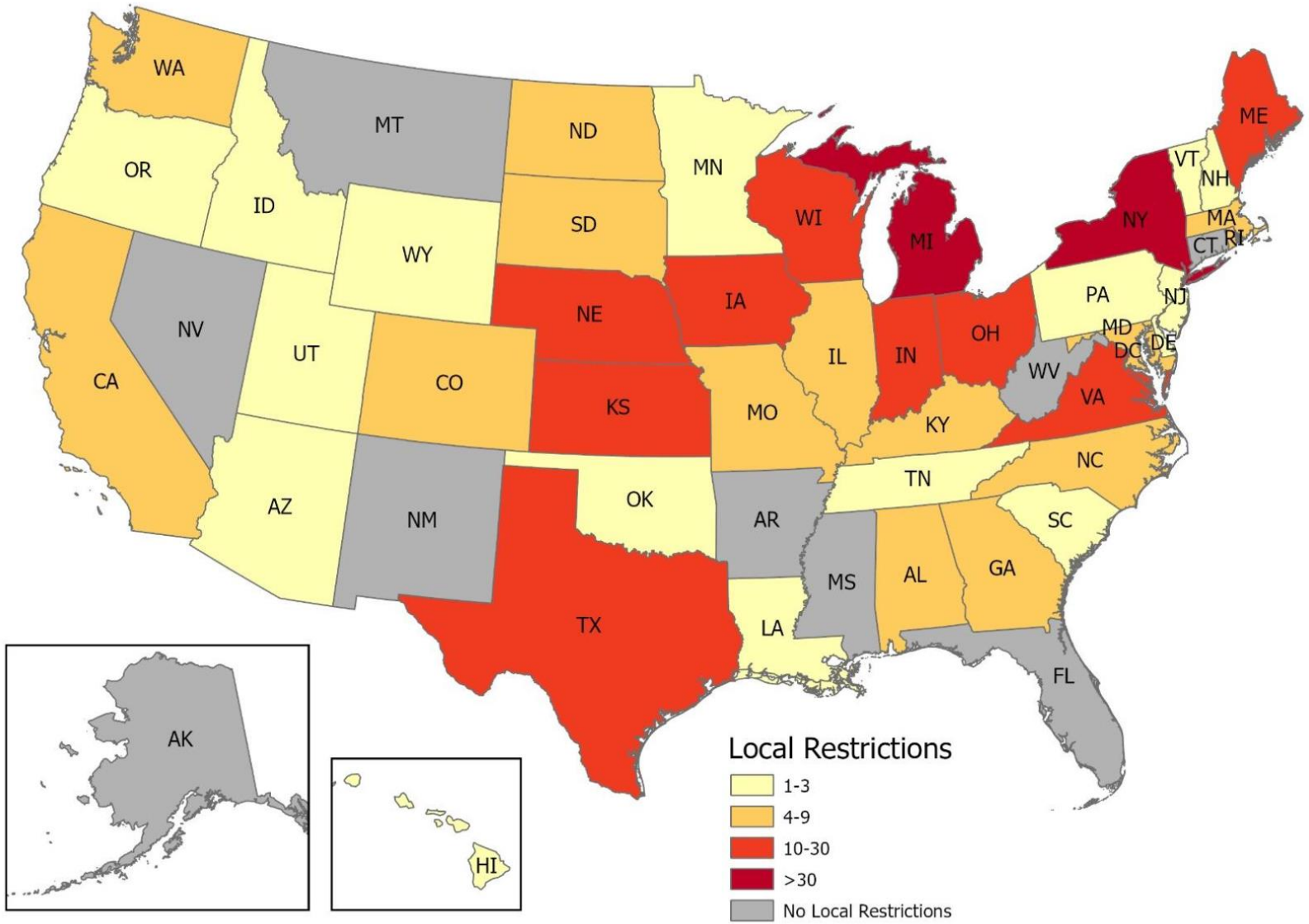
- ▼ 17.2%
- ▼ 4.3%
- ▼ 42.2%
- ▲ 2.0%
- ▼ 9.4%
- ▲ 10.8%

Gross total: ▼ 15.6%

Source: U.S. EPA

What are renewable energy restrictions?

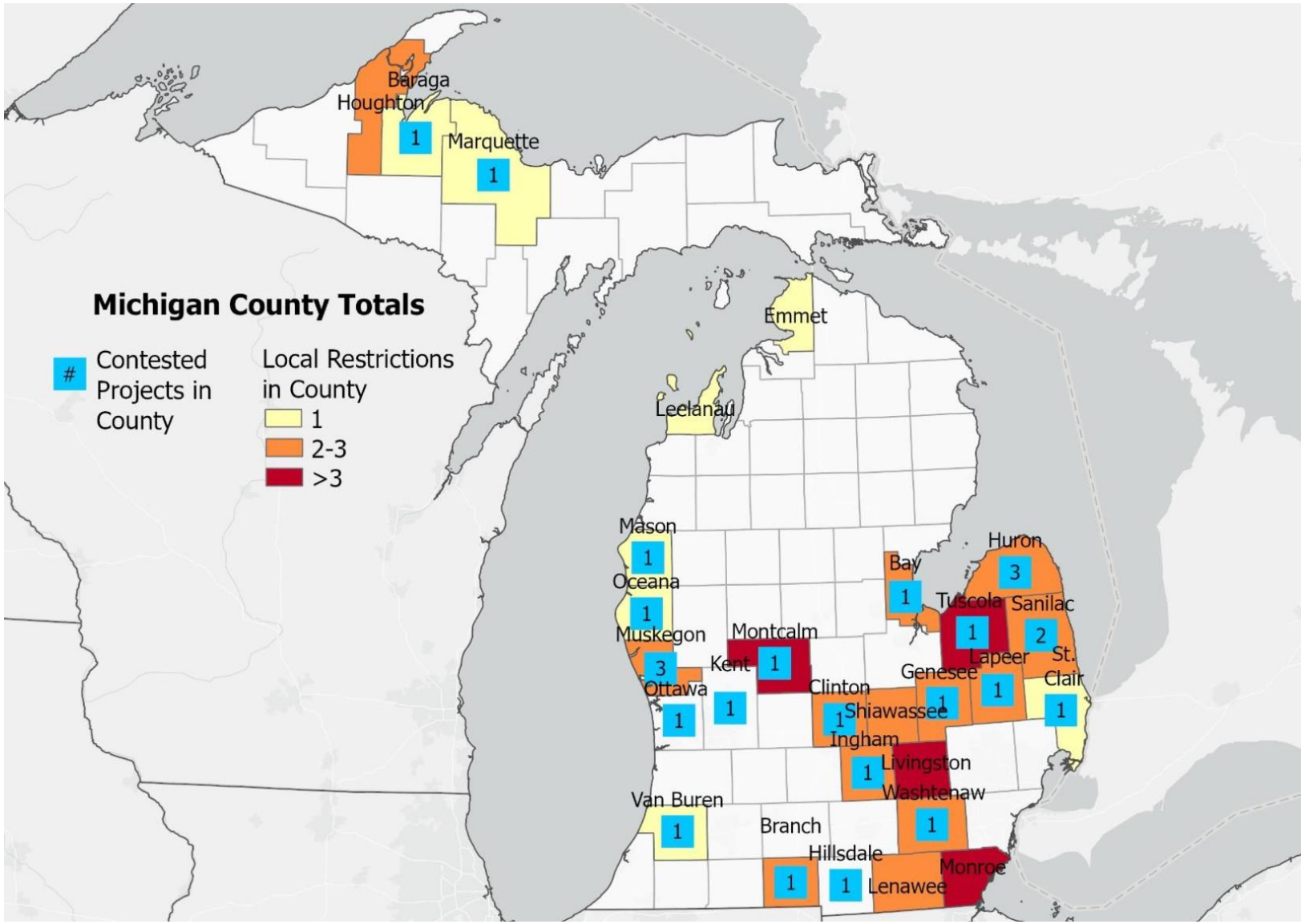
- Local or county land-use restrictions against wind and solar energy facilities
- Generally, includes…
  - Setback requirements from certain man-made or natural objects
  - Noise levels
  - Size restrictions on generation capacity or land area
  - Ban or moratorium



Source: Eisenson et al. (2024)

U.S Restrictions

- 395 local restrictions across 41 states, 19 state-level restrictions
- 73% more than May 2023
- MI and NY have the most local restrictions of any states



Source: Eisenson et al. (2024)

Michigan Restrictions

- 48 total
- 73% impacting wind development
- 37% solar development

- Growing importance of solar and wind
- Interconnection delays
- Lackluster emissions reductions
- Large number of renewable energy restrictions

How are policymakers trying to address these issues?

Clean Energy Future Package (2023)

- Requires utilities to generate 60% of electricity from renewable sources, 80% from carbon-free sources by 2035
- By 2040, the clean energy standard rises to 100%

Source: Michigan House Democrats

Clean Energy and Jobs Act (2023)

- Allows MPSC to preempt local restrictions for solar projects (>50 MW), wind projects (>100 MW)
- Local governments may retain control over permitting large projects if they adopt a compatible renewable energy ordinance
  - If the local government fails to act or denies a permit for an application that meets state requirements, the MPSC obtains jurisdiction

Source: Michigan House Democrats

Research and Methods

Research Questions

1. What is the relationship between the most productive localities for wind and solar energy in Michigan and the presence of renewable energy restrictions?
2. How much would the statewide wind and solar energy potential increase if all renewable energy restrictions were removed?

Hypotheses

1. Localities with the highest wind and solar energy productivity are **more likely** to have renewable energy restrictions in place compared to less productive areas.
2. Removing renewable energy restrictions across Michigan will **lead to a significant increase** the state's overall wind and solar energy potential.

Data

Variable	Source
Dependent Variable	
RE restriction	Sabin Center
Independent Variables	
Existing solar capacity	U.S. Energy Information Administration
Existing wind capacity	U.S. Energy Information Administration
Solar power output	Global Solar Atlas
Wind power output	Global Wind Atlas
Control Variables	
Per capita income	U.S. Bureau of Economic Analysis
Unemployment	U.S. Bureau of Economic Analysis
Republican vote share	MIT Elections
Age	U.S. Census Bureau
Urban-Rural continuum	U.S. Department of Agriculture
Neighboring restriction	Sabin Center
Neighboring wind capacity	U.S. Energy Information Administration
Neighboring solar capacity	U.S. Energy Information Administration

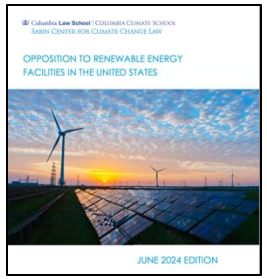
Methods

Data Collection

Data Preprocessing

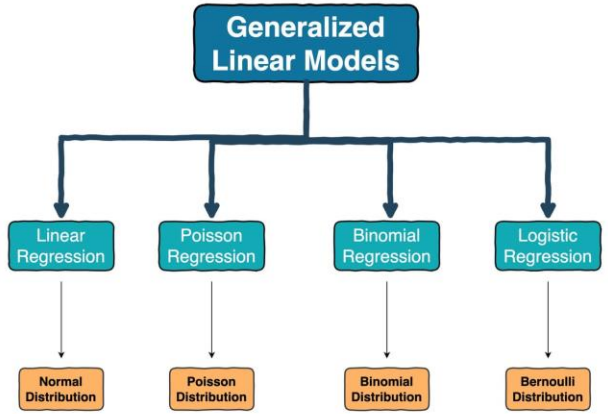
Model Development

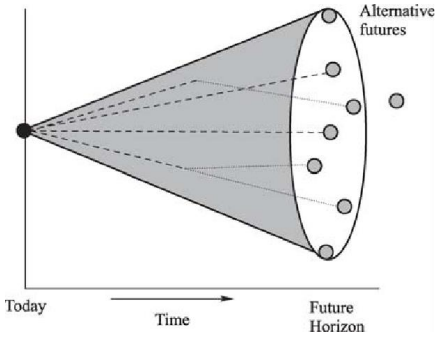
Model and Scenario Implementation



United States® Census Bureau

ArcGIS Pro





Next Steps

- Finalizing data collection and preprocessing tasks
- Model development, implementation, and iteration
- Dissemination of results and policy implications

Thank you for your time!

Questions?

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