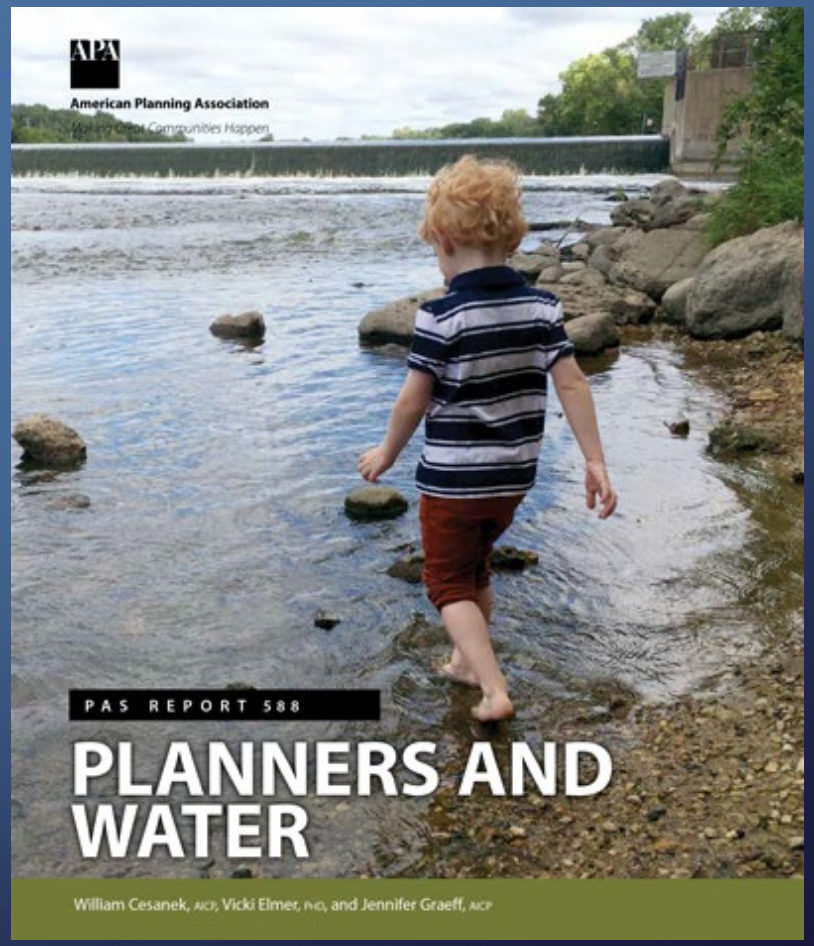
WHEN THE CLOUD DROPS: PLANNING FOR DATA CENTERS

WATER AND PLANNING NETWORK

OCTOBER 30, 2026

APA'S WATER AND PLANNING NETWORK

1. Free network of water and land use professionals created by the American Planning Association (APA)
2. You don't need to be an APA member to join
3. 550 W&P Network members
4. Bi-monthly newsletters
5. 4 webinars a year with CM credits offered
6. In-person meetings at conferences
7. Publications on water and planning issues
8. *Planners and Water* Report from APA



TODAY'S WEBINAR SPEAKERS

- **Mary Ann Dickinson**
  Consultant, Land & Water Policy
  Lincoln Institute of Land Policy



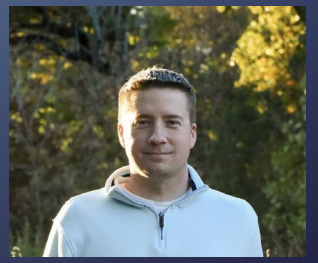
- **Brett Gracely, P.E.**
  Water Planning Practice Leader
  Plummer



- **Manohar "Manny" Patole**
  Industry Assistant Professor
  NYU's Center Urban Science &Progress



- **Kyle Mucha, AICP**
  Principal Planner
  McKenna



Members of APA – Water Planning Network – Steering Committee

LINCOLN INSTITUTE
OF LAND POLICY

DATA CENTER SITING ISSUES

1

How do data centers impact communities? We will discuss these impacts today.

2

If the negative impacts can't be eliminated, what can communities do to manage them?

3

What strategies are communities already utilizing to extract the greatest local benefits from data centers?



MANNY PATOLE INDUSTRY ASSISTANT PROFESSOR, NYU

- Manohar “Manny” Patole is a place-based urban livability advocate working at the intersection of Community, Policy, and Technology. Currently he is Industry Assistant Professor with NYU's Center for Urban Science and Progress , Senior Fellow with NYU Alliance for Public Interest Technology, Co-Cities Fellow and on the NYU Climate Initiative.

ACADEMICS OF DATA CENTERS

MANNY PATOLE

NO STANDARD DEFINITION OR METRICS

Data Centers: Infrastructure Without Standards

- **Definitions: Inconsistent terminology obscures differences between facilities, technologies, and operations.**
  - **Example: Distinguishing direct cooling water from indirect electricity-related water consumption.**
- **Complexity: Interconnected infrastructure spans multiple sectors, geographies, disciplines, and jurisdictions.**
  - **Example: Connecting water withdrawals, electricity generation, cooling technologies, and watersheds.**
- **Transparency: Proprietary information limits understanding of resource consumption and environmental impacts.**
  - **Example: Limited facility-level reporting prevents independent verification of water consumption.**
- **Measurement: Inconsistent metrics complicate comparisons of environmental and socioeconomic impacts.**
  - **Example: Different cooling technologies and regional conditions complicate meaningful comparisons.**
- **Governance: Fragmented oversight obscures accountability across infrastructure lifecycles and affected communities.**
  - **Example: Multiple agencies regulate water, electricity, development, and environmental impacts.**

202 to 1: Pennsylvania voted to block data centers from becoming 'utilities' — the one label that would have let them take your land





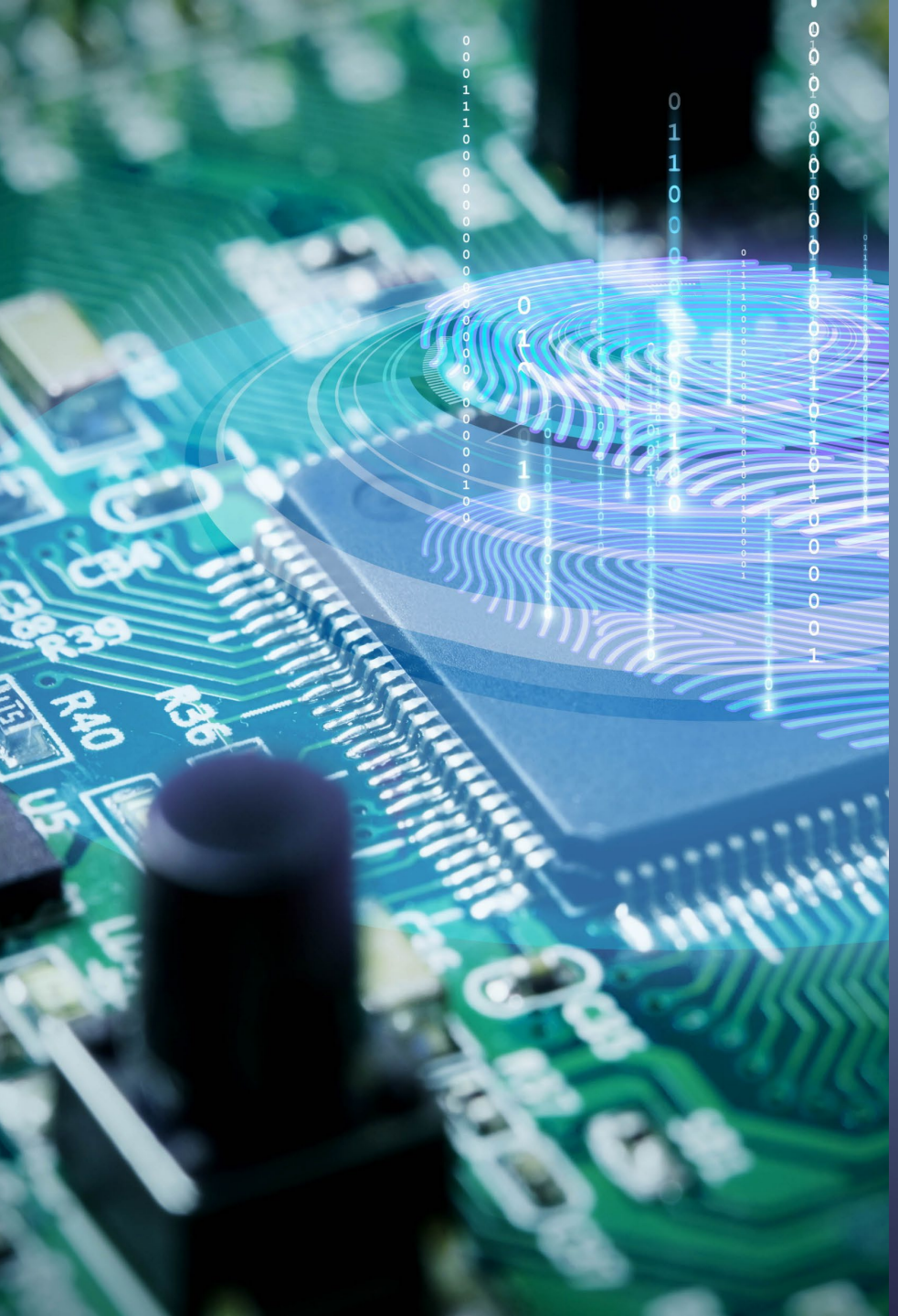


Andy Diaz ✔
@andrewjpdiaz

A tech CEO bragged that AI would be 'a utility like electricity.' Pennsylvania heard the quiet part: utilities can condemn your land. Nice pitch.

Pennsylvania House Bill 2674

- **Legislative action: Pennsylvania's House passed legislation aimed at preventing data centers from receiving public utility status.**
- **Regulatory distinction: The proposal seeks to distinguish private data center operations from traditional utilities providing essential public services.**
- **Financial implications: Public utility status can confer regulatory advantages, potentially affecting infrastructure costs, financing, and development.**
- **Local control and eminent domain: Supporters argue the bill would prevent developers from using utility privileges to override municipal zoning, acquire property, or secure rights-of-way.**
- **Strong bipartisan support, but not yet law: House Bill 2674 passed 202–1 on October 19, 2026, and now requires Senate approval and the governor's signature.**



OPACITY IN DATA CENTER SITING AND OPERATIONS

Invisible Infrastructure, Limited Public Accountability

- Limited public disclosure of energy use, water consumption, emissions and supply chains.
- Complex corporate structures and nondisclosure agreements obscure operational impacts and accountability.
- This opacity limits community awareness, meaningful participation, and informed public decision making.

RESEARCH ON THE DRIVERS OF US DATA CENTER SITING

Ancona et al July 2026

- Nameplate Capacity (The Sum Of The Maximum Rated Output Capacities Of Power Generators)
- IT Employment (Number Of Local Workforce In IT Occupations)
- Broadband Quality (Composite Index Of Fixed Broadband Speed And Coverage)
- Natural Hazards (Frequency Of Climate- And Weather-related Hazards Scaled By City Area)
- Retired Coal Plants (Number Of Retired Coal-based Generators)
- Energy Expenditure (Total Industrial Spending On Electricity And Natural Gas)
- Energy Grid Stress (Composite Measure Of Electric Grid Exposure And Sensitivity To Power Outages)
- Electricity Price Variability (Temporal Variability Of State-level Industrial Electricity Prices)
- State Tax Incentives (Presence Of Tax Benefits For Data Centers)
- Water Stress Index (Composite Index Of Availability Of Drinkable Water).

Article | Published: 31 July 2026

Urban infrastructure and fossil fuel industrial legacy drive US data center siting

Camilla Ancona, Ofek Lauber Bonomo, Anton Rozhkov & Maurizio Porfiri

Nature Cities **3**, 756–767 (2026) | Cite this article

Save article

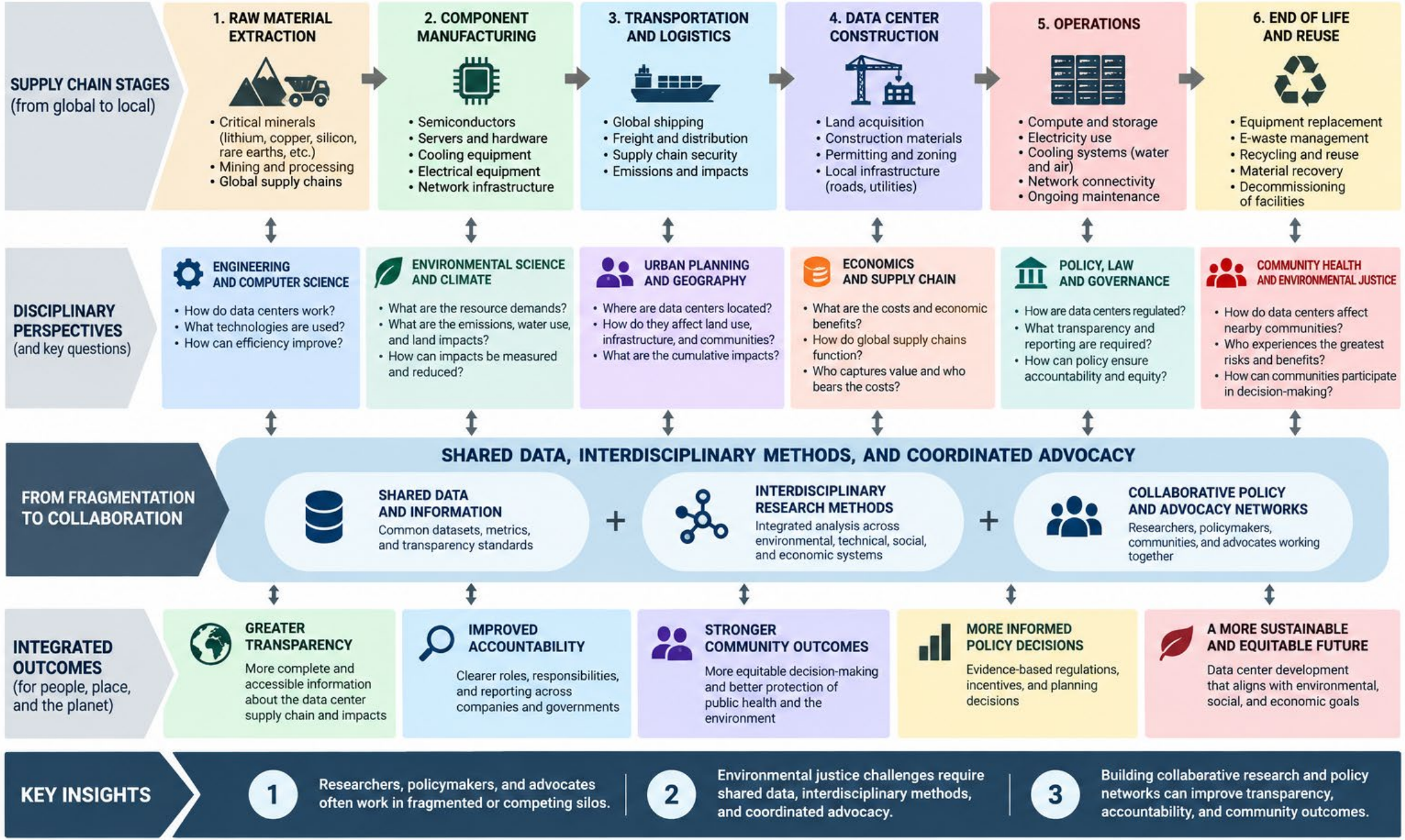
2283 Accesses | **1** Citations | **85** Altmetric | Metrics

Abstract

Data centers form the physical backbone of the digital economy, yet their integration into the US urban fabric remains poorly understood. Here we demonstrate that data centers are an overwhelmingly urban phenomenon, with 97.5% of facilities situated in metropolitan and micropolitan statistical areas, challenging the prevailing narratives of 'rural cloud expansion'. Their spatial logic is driven by the nameplate capacity of local power plants and, to a lesser extent, by broadband quality, retired coal plants, information technology employment and natural hazards. The reliance on local power systems embeds data center siting within state-level energy generation patterns, amplifying geographic contrasts in the sustainability of the data center boom. Population-based projections of data centers' growth indicate that the digital transition will reinforce existing urban hierarchies rather than catalyze decentralization. These findings suggest a path-dependent evolution linked to existing infrastructure and fossil fuel industrial legacy, posing considerable challenges to urban livability.

Understanding the Data Center Supply Chain

A Shared Research Framework Across Disciplines





BRETT GRACELY, P.E.
WATER PLANNING PRACTICE LEADER, PLUMMER

- **Brett has extensive environmental and water resources engineering and management experience in Colorado, Arizona, and California. His project expertise includes groundwater and surface water hydrology & hydraulics, water supply development, water rights engineering, environmental permitting, planning, and assessment as well as integrated resource planning and modeling.**

RESOURCE PLANNING

BRETT GRACELY

LAND USE

- Hyperscale Data Center (50-100+ MW IT load)
  - Land footprint: 100-300 acres (sometimes larger)
  - Building footprint: 500,000 – 1.5+ million sq. ft.
- Mid-Size Enterprise Data Center (5-20 MW)
  - Land footprint: 10-40 acres
  - Building footprint: 50,000 – 250,000 sq. ft.
- Rule of Thumb
  - 205 acres per MW of IT capacity (varies by design & expansion plans)



ENERGY USE



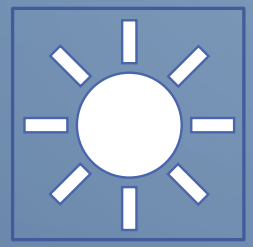
Power Capacity

Small Enterprise: 1-5 MW

Mid-Size: 5-20 MW

Hyperscale: 50-300+ MW

AI Focused Campuses: 300 – 1,000+ MW (increasingly common)



Annual Energy Consumption

A data center running continuously: 1 MW = 8,760 MWh/year

- 100 MW can power 75,000 – 100,000 homes (pending region)



Energy Efficiency – Power Usage Effectiveness (PUE)

Excellent modern: 1.15 – 1.3

Average: 1.4 – 1.6

Older: 1.8+

Total Facility Power = IT Load x PUE

- Example: 100 MW IT Load with 1.25 PUE = 125 MW total draw

WATER USE



Air-Cooled (Minimal Water)

Near zero operational water use

Higher electricity use



Evaporative / Cooling Tower Systems (Common)

1–5 million gallons per day (MGD) for a 100 MW facility

- Or roughly: 2–5 gallons per kWh

Annual water use for 100 MW: ~300–1,500 million gallons per year (highly climate-dependent)



Liquid Cooling for AI

Can increase water intensity if cooling towers are used

Some facilities are shifting to closed-loop or recycled water systems

GENERAL OBSERVATIONS

Resource	Typical Use
Land	150-250 acres
Electricity	~876,000 MWh/Year (IT only) = 876 GW
Total Power Draw	~110 – 130 MW Continuous
Water	300M – 1.5B gallons/year





IMPORTANT TRENDS (2025/2026 CONTEXT)

- AI data centers are increasing:
  - Power density (50–100+ kW per rack)
  - Total campus power (300–1000+ MW)
- Water constraints are driving:
  - Air cooling in dry regions
  - Reclaimed wastewater use
- Utilities are now planning multi-gigawatt data center corridors.
- It's a dynamic industry; many technology, planning factor, and facility components are changing simultaneously.

ZONING FOR DATA CENTERS

KYLE MUCHA



KYLE MUCHA, AICP PRINCIPAL PLANNER - MCKENNA

- **Kyle partners with suburban and rural communities across the Great Lakes Region to aid in the development of modern zoning ordinances, sustainable site development, advocacy for residents and community stakeholders, and the creation of place based on community input.**

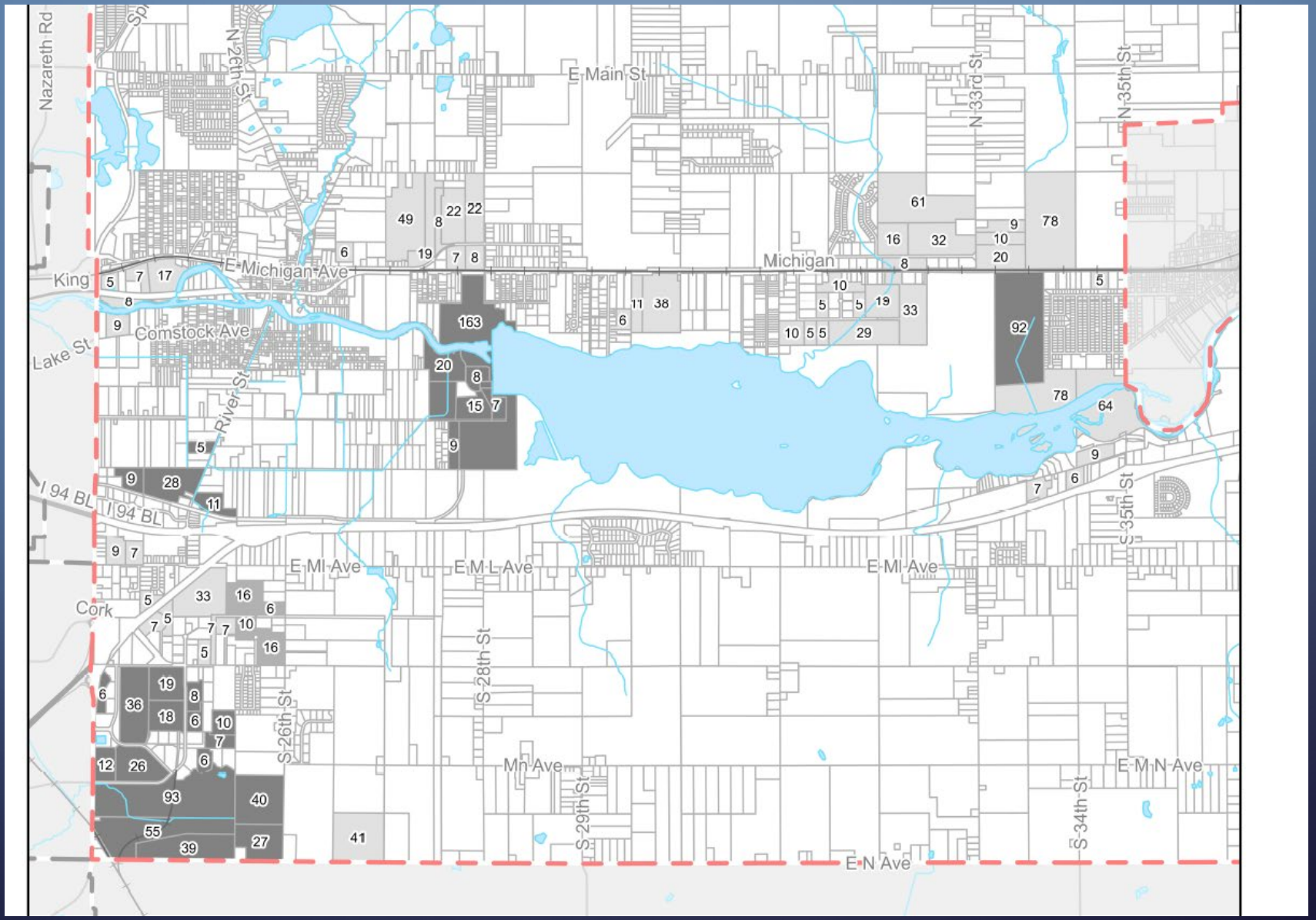
PROJECT CONSIDERATIONS

Suitable locations for the project:

- Proximity to transmission lines & substations
  - Brownfield or Greyfields
  - Industrial areas/districts
  - Agricultural land
    - Prime Farmland verse Non-Prime Farmland
    - Farmland & Open Space Preservation Programs
- Land Use Type
  - Permitted verse Special Land Use

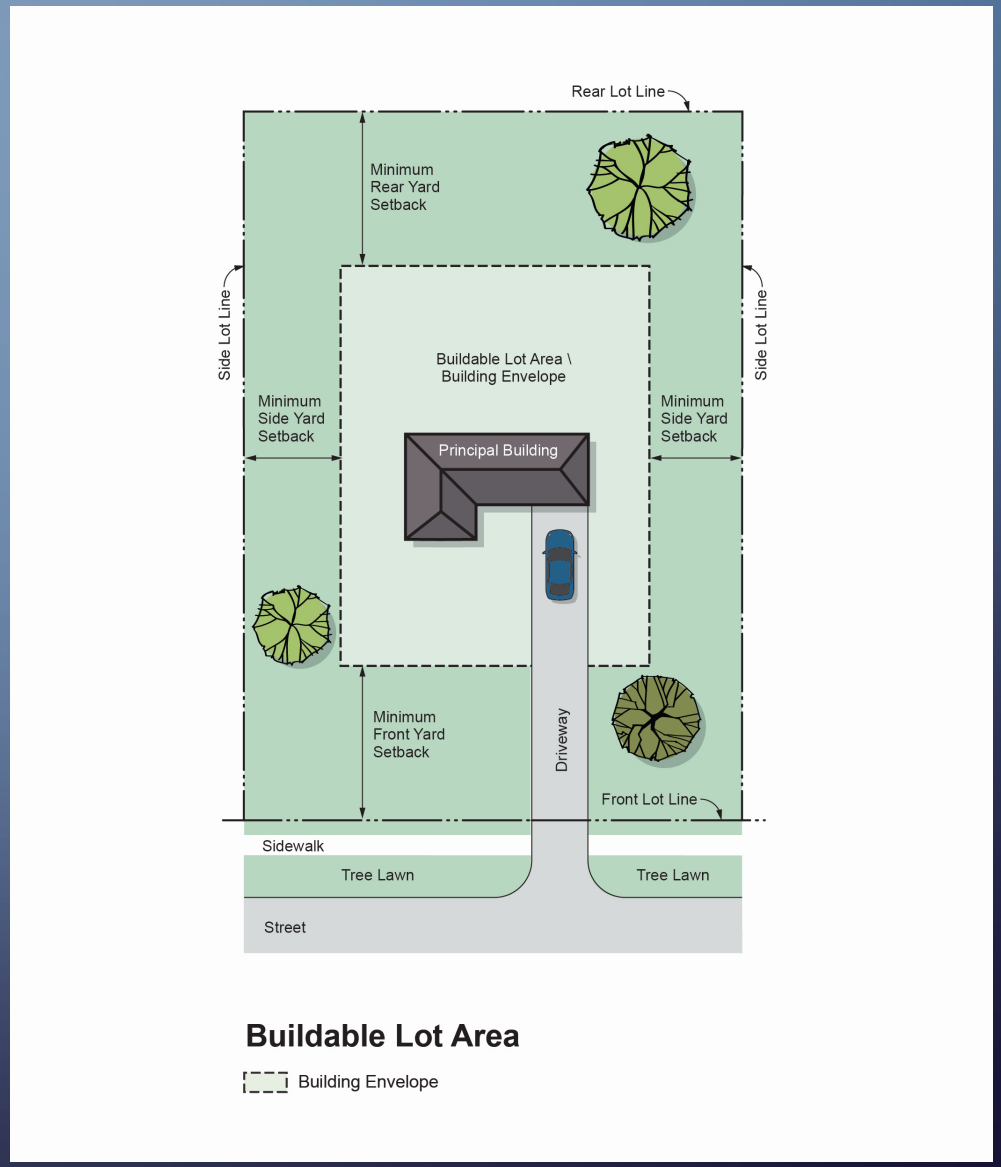


SITE SELECTION – ZONING DISTRICTS



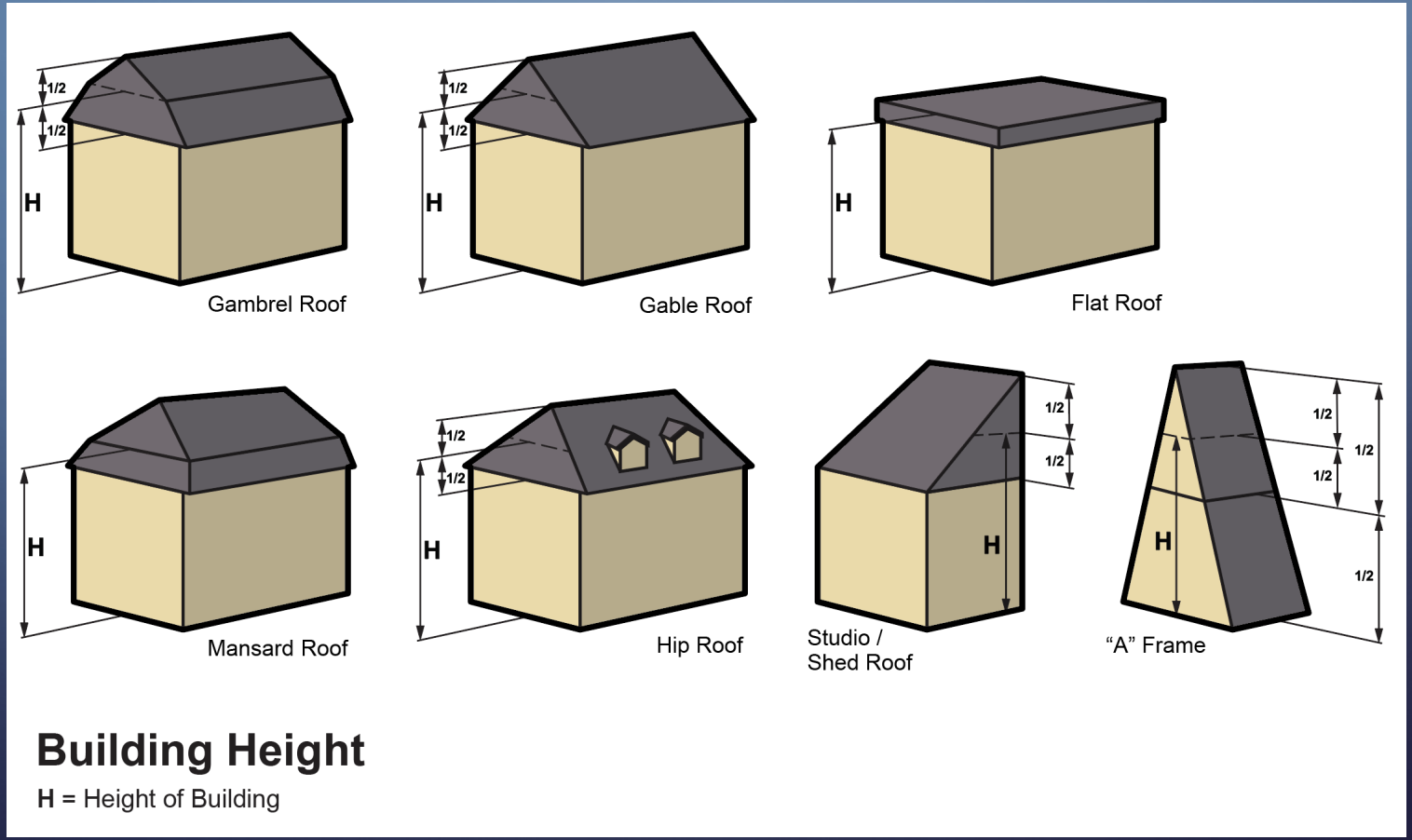
ZONING REGULATIONS

- LOT COVERAGE
  - FOLLOW DISTRICT STANDARDS?
- SETBACK PROVISIONS
  - FACILITY ITSELF
  - COOLING EQUIPMENT
  - MECHANICAL EQUIPMENT



ZONING REGULATIONS

- BUILDING HEIGHT



ZONING REGULATIONS

- SOUND
  - Daytime Limits
  - Nighttime Limits
  - Tonal Sound
  - Octave Bands



ZONING REGULATIONS

- VIBRATION
  - Vibration Monitoring
  - Vibration Isolation & Mitigation
  - Mitigation Against Ground-borne Vibration



ZONING REGULATIONS

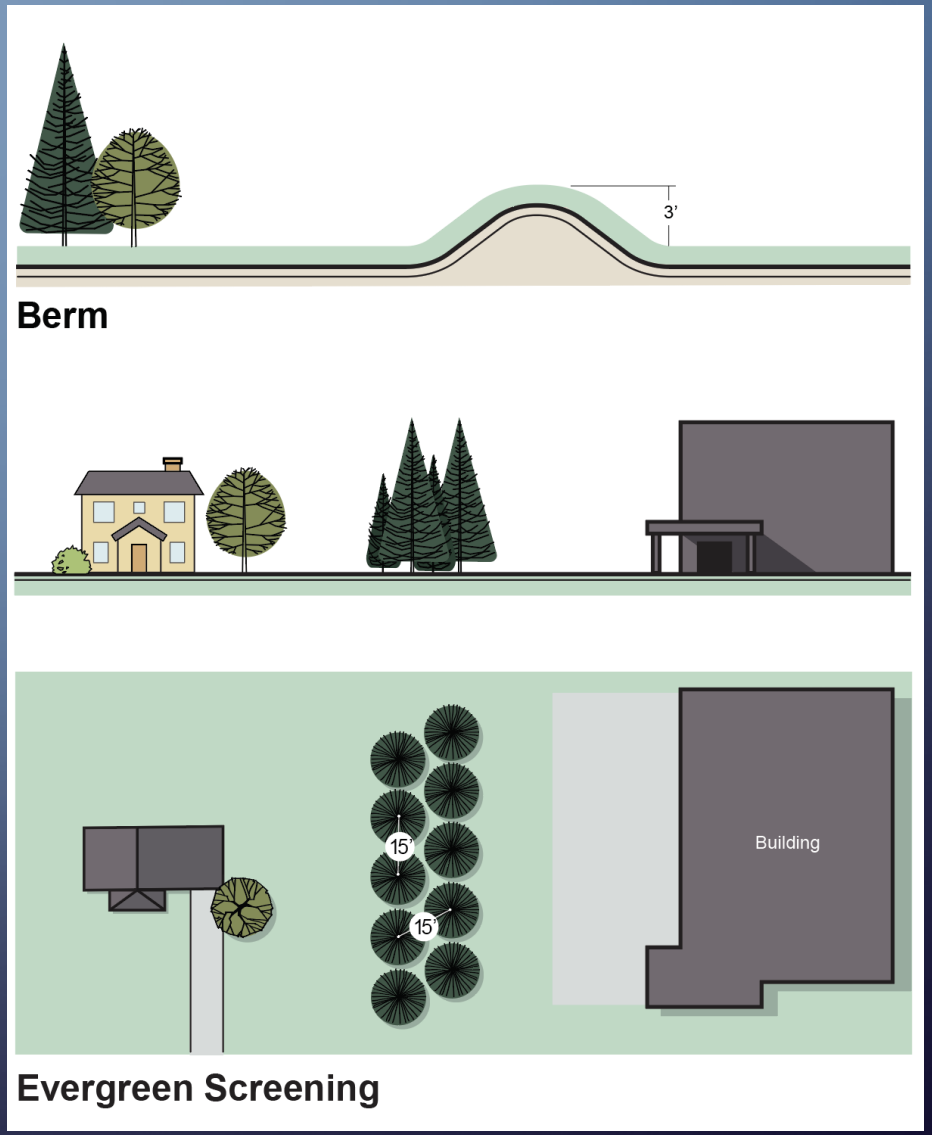
- UTILITY USAGE
  - Water
    - Utility Provided
    - Closed Loop
    - Ancillary
  - Energy
    - Utility Provided
    - On-Site Generation





ZONING REGULATIONS

- VISUAL SCREENING
  - Berms
  - Evergreen Trees
  - Deciduous Trees
  - Other Methods?



ZONING REGULATIONS

- GENERATORS





ZONING REGULATIONS

- PUBLIC SAFETY





ZONING REGULATIONS

- ACCESS DRIVES AND ROADWAYS





ZONING REGULATIONS

- DECOMMISSIONING



EMPOWERING THE COMMUNITY

MARY ANN DICKINSON

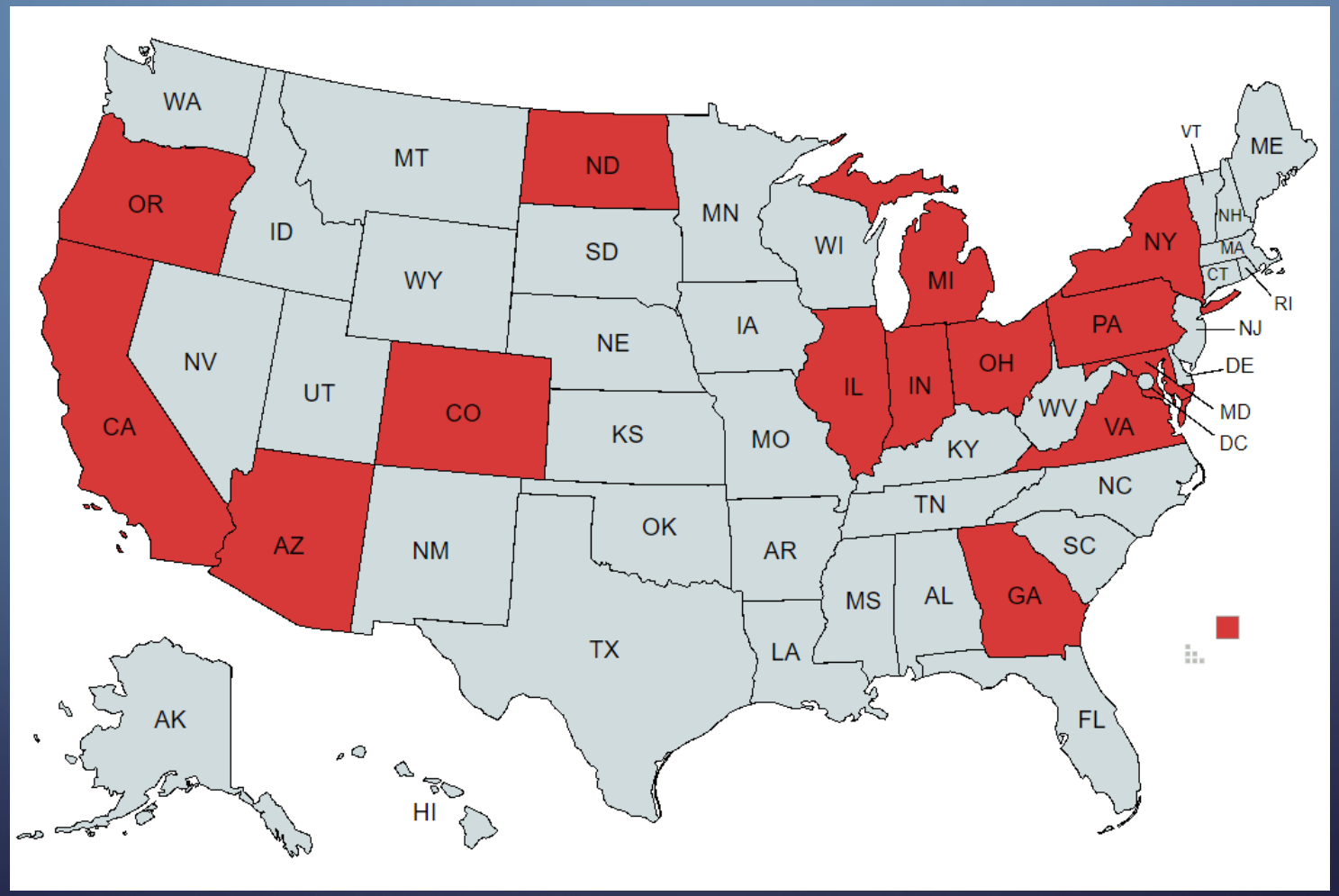


MARY ANN DICKINSON
CONSULTANT, LAND & WATER POLICY
LINCOLN INSTITUTE OF LAND POLICY

- **Mary Ann Dickinson is the Co-Chair of the APA Water and Planning Network. She was the Founder and President/CEO for 15 years for the Alliance for Water Efficiency, a non-profit organization dedicated to promoting the efficient and sustainable use of water in the United States and Canada. She now consults for the Lincoln institute of Land Policy and has also served as the President of the Board of her own local water utility.**

Data Center Ordinance Trends

From our preliminary research, the shaded states have city or county ordinances that explicitly address "data centers." This analysis is not exhaustive.



ENVIRONMENTAL LAW • INSTITUTE

Data Center Ordinance Examples

Cities and counties have many authorities through the zoning, permitting, and conditional approvals process to reflect community concerns.

Land Use Authority

- Zoning Overlay + Opportunity Districts: Atlanta, GA
- Siting requirements within permitting process: Yorktown, VA
- Conditional Use Permits (ending by-right development): Loudon County, VA
- Redevelopment plan amendment: New Brunswick, NJ

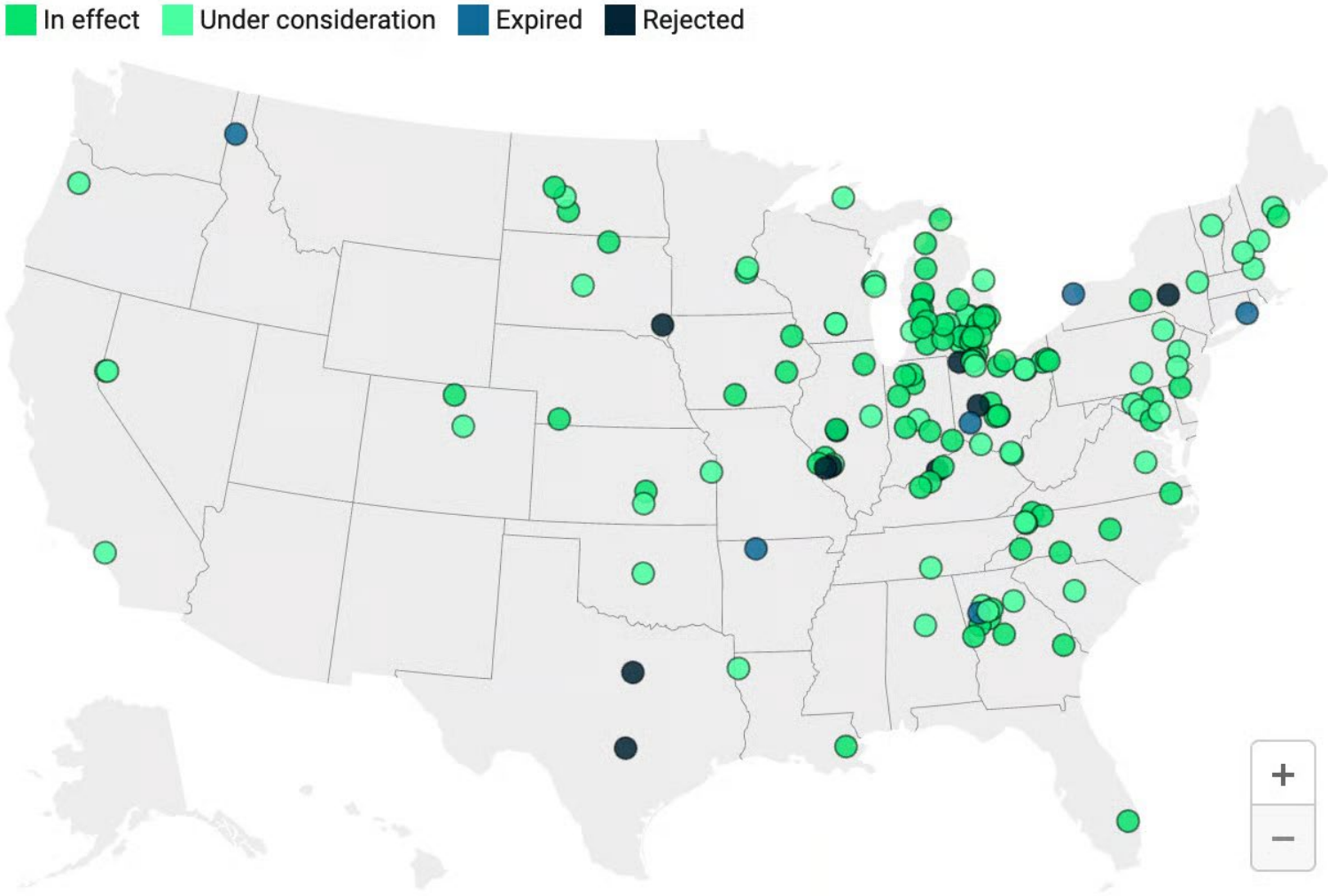
Environmental Limits

- Noise limits: Divide County, ND
- No potable water for data center operations: Marana, AZ
- Prohibit diesel generator testing on "unhealthy air" days: New Jersey DEP

ENVIRONMENTAL LAW • INSTITUTE

150+ legislative bodies across the US have taken action on data center moratoriums

Of these, most are at the local level. 16 of the efforts are at the state level, marked on the map by their respective state capitals.



Map: Katie Malone/Technical.ly • Created with Datawrapper

WHAT LOCAL COMMUNITIES CLEARLY NEED



ADEQUATE LOCAL AUTHORITY TO MAKE THE RIGHT DECISIONS



ANALYSES TO ADDRESS THE LOCAL ENERGY AND WATER AVAILABILITY



STRATEGIES FOR AVOIDING RATE SHOCK



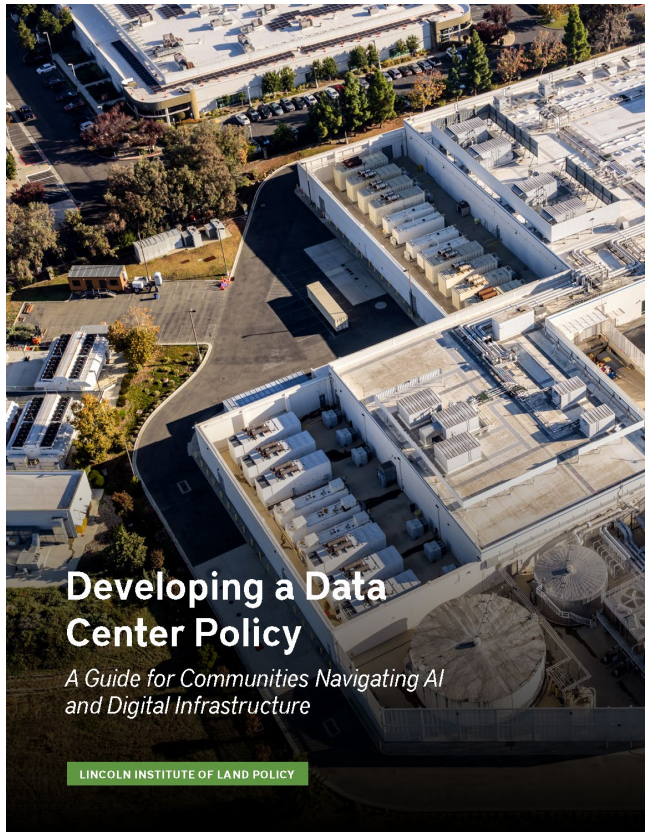
ADVICE ON TAXATION AND FISCAL IMPACT



ABILITY TO NEGOTIATE COMMUNITY BENEFIT

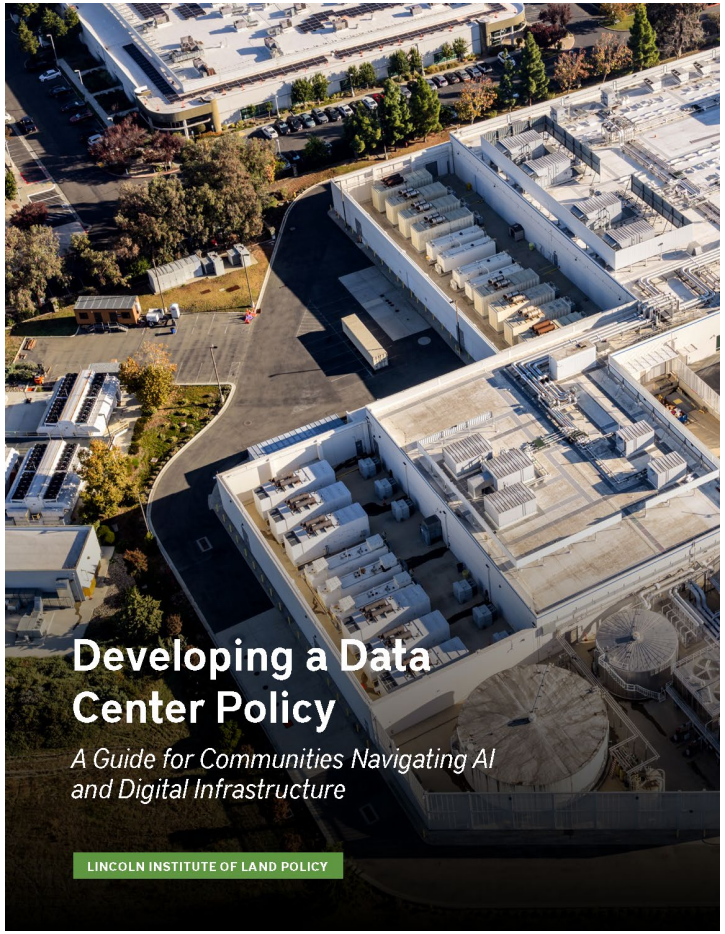


TOOLS FOR ADDRESSING THE FINANCIAL RISK

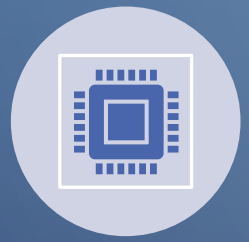


LINCOLN INSTITUTE DATA CENTER GUIDE

- Analysis of the resource issues
- Guidance on options for data center ordinances communities to use and modify
- A strategy for avoiding water rate shock to household ratepayers
- How to do community benefit agreements
- Options to manage financial risk


Developing a Data Center Policy
A Guide for Communities Navigating AI and Digital Infrastructure
LINCOLN INSTITUTE OF LAND POLICY

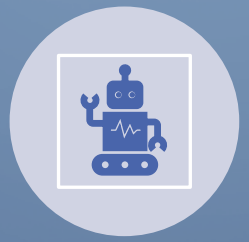
UNIQUE FACTS & TAKE AWAYS



COMPANIES, SUCH AS MICROSOFT, ARE TESTING UNDERWATER DATA CENTERS



MARCH 2025: APPROX. 11,800 DATA CENTERS WORLDWIDE (OVER 5,400 IN USA)



AI USE ACCOUNTS FOR 20% (+) OF DATA CENTER WORKLOAD CAPACITY

- Reminder: each AI prompt consumes water!
- Great Lakes Region becoming hotspot for data centers
- Emerging trend: utilizing ‘grey water’ to reduce environmental impact

THANK YOU FOR JOINING US!

- Mary Ann Dickinson
  madickinson@lincolninst.edu



- Brett Gracely, P.E.
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- Manohar “Manny” Patole
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