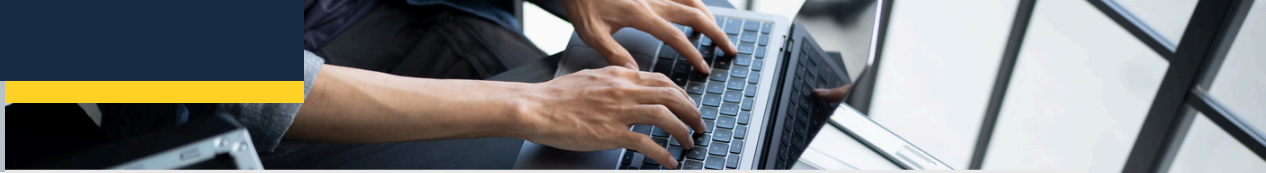

Big Data, Data Centers, and Their Environmental Impacts

What is the best path forward?

Contributing Authors: Kathryn Fernholz, Teresa Floberg, Ed Pepke, Ph.D., Sarah Harris

This article builds on the findings of the January 2026 Dovetail Report on [the environmental impacts of data centers](#). Also see the infographic available [here](#).





Data centers¹ have become essential infrastructure for the modern economy, and data center electricity use in the U.S. could triple again by 2028. The pace of digital growth -- driven by cloud computing, mobile devices, and artificial intelligence -- is outstripping traditional planning cycles. This does not signal crisis, but it does create a need for more proactive, coordinated decision-making. Communities can be better positioned to manage impacts and guide outcomes that will capture future benefits. Communities, utilities, and policymakers are paying closer attention to how and where data centers are built.

Energy demand is one of the most immediate considerations. High-density AI servers draw substantially more power than traditional equipment, and the cumulative load can strain local grids. Water use for cooling is another key factor, particularly in regions already managing limited supplies. Energy efficiency has improved across the industry, but water efficiency has not kept pace, making cooling technology choices increasingly important. Local impacts such as noise, land use, and infrastructure needs are also becoming more visible. Large facilities require substantial acreage and generate continuous low-frequency noise. These factors influence nearby neighborhoods, agricultural areas, and industrial zones.

The urgency lies in the timing. Data center development is accelerating, and decisions made in the next few years will shape local landscapes and resource systems for decades. Communities that wait to react may find themselves managing impacts rather than guiding outcomes.

Communities that wait to react may find themselves managing impacts rather than guiding outcomes.

There are several specific strategies that help communities and operators reduce impacts and improve long-term results. These strategies focus on **thoughtful siting, cooling technology choices, energy planning, and transparency.**

Thoughtful siting is one of the most effective strategies for guiding outcomes associated with data center development. Locating data centers near existing industrial loads, district energy systems, or waste-heat users can reduce strain on local grids and create opportunities for heat recovery. Aligning new facilities with regions that have strong renewable energy resources or available transmission capacity can also improve system performance. An *industrial symbiosis model*² can be applied to data center siting (see sidebar on the following page). These decisions can significantly reduce long-term infrastructure costs.

¹ A data center is a facility or building that houses IT infrastructure—including servers, data storage drives, and networking equipment—used to store, manage, process, and distribute digital data and applications.

² An *industrial symbiosis model* involves industries collaborating to exchange materials, energy, water, and/or by-products to enhance resource efficiency, sustainability, and profitability. Often based in eco-industrial parks, this model reduces environmental impact, lowers costs, and fosters a more circular economy.

Cooling technology is another area with significant potential. Direct-to-chip liquid cooling, immersion cooling, hybrid systems, and the use of reclaimed or non-potable water can substantially reduce water consumption. Communities can encourage or require these technologies through permitting processes, utility partnerships, or local ordinances.

Energy planning is critical and coordination between operators, utilities, and regulators becomes essential. Long-term resource planning that accounts for data center growth can help ensure that new demand does not create reliability challenges or cost shifts for other customers. Integrating renewable energy and demand-management strategies can support both grid stability and sustainability goals.

Transparency is another important tool. Clear reporting on energy use, water consumption, cooling technologies, and projected growth helps communities make informed decisions. Public disclosure supports accountability and constructive dialogue between operators and residents. Communities can incorporate transparency requirements into zoning, permitting, or development agreements.

Applying Industrial Symbiosis Models to Data Center Development

An industrial symbiosis model involves industries collaborating to exchange materials, energy, water, and/or by-products to enhance resource efficiency, sustainability, and profitability. Often based in eco-industrial parks, this model reduces environmental impact, lowers costs, and fosters a more circular economy.

Dovetail has examined “business clustering” which applies some of the same concepts of resource efficiency and industrial synergies to create competitive advantage. The Dovetail report on [Forest-Based Economic Clusters](#) concluded that these approaches can be driven by entrepreneurship, innovation, public programs (government), private organizations (trade groups), research and educational institutions, and cultural identity. The creation and success of a cluster is based upon mutual benefit of the members. The specific examination of urban wood utilization as part of a [Twin Cities Case Study](#) found that the ingredients for a successful industry cluster include: feasibility analysis, technical and research support, government actions, complementary industries, entrepreneurship and innovation, access to raw materials, markets and transportation networks, leadership collaboration, and a favorable business climate.

Recent work by [ReImagine Appalachia](#) has examined the potential for greater utilization of the heat generated by data centers. Their [reporting](#) examined opportunities related to agriculture, manufacturing, food processing, pharmaceuticals, on-site power generation, and water treatment systems. Examples of community and industry data center waste heat applications are provided from projects throughout Europe as well as innovations occurring in the U.S.

Data centers bring economic benefits, including construction jobs, long-term operations roles, and increased tax revenue. They can also support local workforce development, infrastructure upgrades, and partnerships with educational institutions. Early engagement allows communities to identify priorities, negotiate community benefits, and ensure that local needs are addressed.

Detailed resources are available to help communities and residents engage in effective data center management, including a data center strategies report from the [National League of Cities](#) that includes policy examples from throughout the U.S., the Urban Land Institute's [Local Guidelines for Data Center Development](#), and the American Planning Association's Data Center [Primer for Planners](#). The recently announced [Community-First AI Infrastructure Initiative](#) from Microsoft may also provide a negotiating model between companies and communities.

Looking ahead, there are meaningful advantages to getting data center development right. Communities that plan proactively can:

- strengthen local infrastructure through coordinated investments,
- attract high-quality jobs and long-term tax revenue,
- support innovation in cooling, energy, and water systems,
- leverage waste heat for district energy or industrial uses, and
- align digital infrastructure with climate and resilience goals.

In some regions, data centers could even become anchors for broader clean-energy development, helping to justify new transmission lines, renewable projects, or energy-storage investments that benefit the wider community.



The expansion of digital infrastructure is a long-term trend, and data centers will continue to play a central role in economic growth and technological innovation. The question for communities is how to guide data center development in ways that align with local goals and resource values. By focusing on siting, technology choices, energy and water planning, transparency, and community engagement, data center development can be both responsible and beneficial.

This article builds on the findings of the January 2026 Dovetail Report on [the environmental impacts of data centers](#). Also see the infographic available [here](#).