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# Understanding The Green Grid's Water Usage Impact (WUI) Metric: A Better Way to Measure Data Center Water Sustainability

As sustainability expectations continue to rise, data center operators are being challenged to think more critically about how resources are consumed and what impact those decisions have beyond facility walls. While energy efficiency has long been the primary focus, water use is quickly becoming just as important.

Metrics such as Power Usage Effectiveness (PUE) and Water Usage Effectiveness (WUE) have helped the industry quantify efficiency. However, these metrics alone do not fully capture the environmental consequences of water consumption. That gap is precisely what the Water Usage Impact (WUI) metric was designed to address.

Let's start with an overview of The Green Grid (TGG)'s metrics.

## A Brief History of Data Center Sustainability Metrics

TGG has played a central role in shaping how the data center industry measures efficiency and sustainability. In 2007, it introduced power usage effectiveness (PUE), which rapidly became the global standard for evaluating infrastructure energy effectiveness. Over time, additional metrics followed, including partial PUE (pPUE), water usage effectiveness

(WUE), energy reuse effectiveness (ERE), carbon usage effectiveness (CUE), and others. Each of these metrics provides valuable insight into a specific aspect of performance. However, they are calculated independently and do not account for how factors such as geography, climate, or resource scarcity influence environmental impact. As sustainability goals expanded beyond energy efficiency alone, it became clear that a more contextual approach was needed.

Additionally, industry voices have called for next-generation metrics that help data centers advance resource efficiency across energy, water, and land use, noting that these broader measures will be critical as digital infrastructure investments rapidly grow.

And so, in 2025, TGG developed its latest metric, water usage impact (WUI). To better understand the importance of WUI, let's start with WUE.

## A Review of Water Usage Effectiveness (WUE)

WUE is a useful metric for understanding how much water a data center consumes relative to the power drawn from the IT equipment. This is basically broken down into two forms: site water use (a calculation measuring the water used at the data center) and source water use (a calculation measuring the amount of water that is utilized in the power production that is being provided to the data center).

While WUE speaks to the balance between water use and power use, it has some notable limitations when used on its own.

## WUE Limitations

Here are some perceived limitations of the WUE metric.

- WUE does not account for where the facility is located or where the water is used.
- It treats all water sources equally regardless of scarcity.
- It can unintentionally encourage design decisions that reduce water consumption at the expense of higher energy or carbon impact.
- In some cases, striving for zero on-site water use may lead to increased emissions if alternative cooling methods rely heavily on energy-intensive systems.
- Future sustainable metric frameworks emphasize the need to align water and carbon measures to better guide investment and operational choices.

Sustainability reports from operators show that data center water demand can pose real risks in water-stressed areas, adding urgency to the need for impact-focused measurement. As data center capacity continues to grow and water stress increases in many regions, these considerations can become more significant.

Because more context was needed, WUI is generally regarded as an improvement upon the WUE metric. Let's dive in.

## Introducing Water Usage Impact (WUI)

Water Usage Impact was developed by TGG to address the above challenges by adding environmental context to water measurement. Rather than focusing solely on efficiency, WUI evaluates the impact of water consumption based on local availability.

At a high level, WUI combines two factors:

1. The amount of potable water a data center consumes for cooling
1. The level of water stress in the geographic region where the facility operates

By bringing these elements together, WUI helps organizations understand not only how much water they use, but also how that use affects local water resources. It expands on the idea of WUE by introducing external water scarcity and environmental impact into the measurement framework.

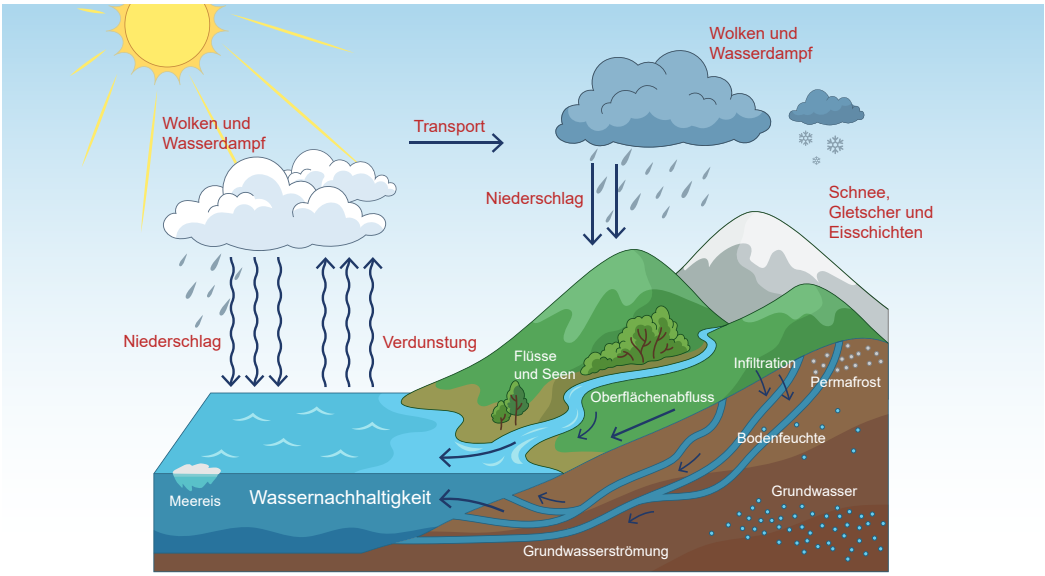
Importantly, WUI focuses on water that is truly consumed. Water that is withdrawn from natural bodies and returned without harm, internally recycled water, and on-site collected rainwater are excluded. This approach ensures the metric reflects real environmental impact rather than simple water movement.

## Why Geography Matters in Water Sustainability

Water is a renewable resource, but its availability varies widely by location. Some regions have abundant supplies with minimal long-term impact from industrial use. Others rely on stressed aquifers or limited surface water, where even modest withdrawals can increase competition between communities, agriculture, and industry.

WUI accounts for these differences by incorporating regional water stress data into its evaluation. This allows data center operators to assess water use decisions within the context of local conditions, rather than treating water as a uniform input regardless of location. Real-world sustainability concerns are already driving attention to this issue. Analyses by environmental organizations highlight that water impacts from data centers may expose companies to operational and financial risk when facilities are located in areas facing water scarcity.

As climate patterns shift and demand grows, understanding these regional dynamics becomes increasingly important for long-term resilience, responsible growth, and better stakeholder decision-making in data center development.




## Summarizing How WUI Differs from WUE

Although WUE and WUI are related, they serve different purposes.

WUE measures how efficiently water is used relative to IT energy consumption.

WUI evaluates how that water use affects the surrounding environment. WUE accounts for source water use, while WUI focuses on scarcity and local impact. WUI also provides insight into how a data center's operations influence regional water availability, something WUE does not address.

Used together, these metrics offer a more complete picture of water sustainability. Used in isolation, WUE may overlook important environmental risks.

## Designed as a Practical Decision Tool

One of the strengths of WUI is that it was designed with real-world operations in mind. The methodology emphasizes clarity, objectivity, and ease of use. It leverages existing data sources such as Data Center Infrastructure Management (DCIM) systems and does not require invasive measurement or operational disruption.

WUI is also intended to support scenario analysis. Data center teams can model how changes in location, cooling strategy, or water consumption levels may influence environmental impact over time. This makes WUI especially valuable during site selection, expansion planning, and cooling system design.

It is also important to note that WUI is not meant to be a benchmarking tool for comparing one data center to another. Instead, it is designed to support internal evaluation, planning, and progress tracking within an organization.

WUI adds some clarity to water-use decisions based on geography and water availability.

## What WUI Means for Cooling System Design

Cooling systems are one of the primary drivers of water consumption in data centers, particularly those that rely on evaporative or adiabatic processes. By accounting for WUI and using the WUI Scoring Calculator designers and operators can better understand how different cooling approaches interact with local water conditions.

In some regions, water-based cooling may offer an efficient and sustainable solution. In others, alternative approaches may reduce environmental impact even if they consume more energy. WUI helps inform these tradeoffs by providing a clearer picture of overall impact rather than focusing on a single variable.

For organizations pursuing long-term sustainability goals, this balanced perspective is essential.

## Key Takeaways

Water Usage Impact can inform data center site selection, assist in optimizing cooling methods, boost transparency and credibility, and track performance and efficiency more effectively.

WUI represents an important step forward in data center sustainability measurement. By incorporating geographic water stress into water use analysis, WUI provides insight that traditional efficiency metrics cannot.

We do acknowledge that, currently, the WUI measurement does not include source water. While WUI is an improvement to WUE, we believe the metric will be even more useful once calculations consider source water.

## Key benefits of WUI include:

- A clearer understanding of how water use affects local resources
- Better support for site selection and cooling design decisions
- Improved alignment between operational efficiency and environmental responsibility
- A practical framework for planning and scenario analysis

In the age of AI and as water availability becomes an increasingly critical consideration, tools like WUI will play a useful role in helping the industry make informed and responsible decisions. We also look forward to further developments supporting the shift toward water usage and sustainability for data centers.

This article is informed by industry research and methodologies developed by The Green Grid, including the Water Usage Impact framework. WP#95 Water Usage Impact (WUI) v1 Metric | The Green Grid

## About the Author

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Dave Meadows is the Director of Technology at STULZ USA. He has over 20 years of experience in mission critical technologies and participates in numerous committees and panels throughout the year. Dave has a BS in Mechanical Engineering from the University of Maryland, Baltimore County. He is also a graduate of the United States Navy Nuclear Power School. Dave is a voting member in several ASHRAE committees.