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Water Innovations

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FROM THE EDITOR

By Kevin Westerling
Chief Editor, editor@wateronline.com

From Scarcity To Stewardship To Sustainability

Every drop of water counts, but when we talk about our collective conservation efforts for the greater good, it's natural to think about high-volume users. Those users are generally on the industrial side of things — agriculture, of course; the energy industry, with its intractable relationship to water; and also the food and beverage industry. Thankfully, there are leaders in these spaces who not only understand the need for sustainable water management — they pioneer it.

David Grant, PepsiCo

Foremost among them is David Grant, senior director of global climate and water solutions at PepsiCo. Under his guidance, the company launched an ambitious water conservation and efficiency program tied to specific targets and deadlines — then outperformed their own aggressive goals. In this Q&A, David shares the keys to the program's success, including the technologies, policies, and culture driving it, as well as his thoughts on the need for broader water stewardship and his vision for advancing sustainability in the future.

PepsiCo reached its 2025 water efficiency goal two years early. First, what was the goal?

PepsiCo has a very long history with water stewardship — it's been integral to the company — and in 2021, when we launched our PepsiCo Positive (pep+) strategy, we continued to put a very strong emphasis on water. One of our goals was to improve operational water use efficiency by 25% by 2025 for all our high-water-risk operations globally.

PepsiCo hit that goal in 2023, two years ahead of schedule. How did you do it?

If I start from the bottom up, one of our core programs is our resource conservation program called ReCon, which focuses on people, process, and technology. The aim is to ensure that all of our systems are operating at their most efficient benchmarks, before we even start looking at advanced technology. And we do that through our people such as the plant operations employees, engineers, and corporate and sector sustainability teams, making sure they have the right training and they're on board with the goal, because we need to win hearts and minds as well. We need to make sure people understand it and our ambition around it.

On the process side, it's making sure we have the right tools in place and the data and systems to help enable our people to work toward this water journey.

When we're at the point where all our operations are running as efficiently as we can get them, then we start looking at the more advanced technologies.

Can you describe some of those advanced technologies and how they're used to save water?

Part of our journey to reduce water consumption is the extent to which we can essentially recover process water — treat it to potable water standards and bring it back into the process again. So, we're now employing membrane bioreactors in 21 facilities across the world, allowing us to drive down freshwater consumption by about 70%.

On the beverage side of the business, one of the largest areas where water is consumed is in our water treatment room. As we bring in water from a utility, a borewell, or wherever it's coming from, we need to treat it to a quality that meets our high quality and safety standards. Typically, we do that by using reverse osmosis (RO), but with traditional RO, you get quite a high reject rate — 30% to 40%. By including additional filtration after that process, either ultrafiltration or closed-circuit reverse osmosis, we're taking that reject and treating it again to extract additional freshwater volume from the reject stream, going from roughly 60% efficiency to around 90%. That's much less demand that we're putting on freshwater sources coming into our site.

In our potato chip factories — and this was an innovation that came out of our Indian business — they've figured out how to capture the moisture that typically gets evaporated when you cook potatoes, which are 80% water. They got together, put in a process, and now we're capturing the condensation that comes out of the fryer, treating it, and then reusing it, saving up to 60 million liters of water per site per year.

The key to all of this as well is our ability to scale. We utilize a number of mechanisms to scale technology — for example, we use platforms such as communities of practice and different technical forums to showcase best practices and share those technologies as much as possible with our facilities around the globe so that we can have a collective, accelerated journey toward water stewardship.

Finally, I'd like to mention digitization. In our beverage plants, for example, we've digitized sub-metering to get very accurate reads in terms of where water's going and where it's being used, and we get immediate feedback if something's going wrong. If there's a leak somewhere, operators can address it right away. In the past, operators would be walking around with a clipboard taking readings and then get to the issue a day or two later. Through digitization, we have real-time information that significantly helps to manage the process, identify the issues, and get on top of them as soon as possible.

How do you know it's the right time to embrace and invest in water reuse, digitalization, and other water-saving practices from an ROI point of view? Some here in the U.S., outside the water-scarce Southwest, may not see the value.

I think we need to be careful about pigeonholing water in terms of costs. We need to have a very holistic view of the associated benefits that accrue as a result of implementing a new technology.

One of the tools that we use is the "true cost of water." There's often this thought that water is cheap, but when you start integrating everything that touches water into that calculation — bringing water onto a site, the treatment cost, chemical costs, energy costs, pumping the water around your site, treating the water again at the tail end of your process — you add all that up and you have a dollar amount per liter or gallon or whatever metric you want to use to know the true cost of water. That equation changes quite significantly. It's not a case of just taking your raw water costs and trying to work out return on investment based on that. You need to figure out the true value chain costs based on your process. And there's no reason why anyone anywhere couldn't be doing this.

Even if you're in a seemingly "water-rich" area?

We can't be complacent, right? I think there's this risk that we sit back and think that water scarcity is somebody else's problem. If we take that attitude, we aren't going to get anywhere. And the risk is that we end up in a situation like Cape Town, South Africa, where they were getting close to a "Day Zero" scenario. You want to take action way before you can get close to that point.

My recommendation would be that every company get a good idea of where they sit in terms of water stress. There are so many global tools available right now to enable that. But even if you're in a non-high-water-risk area, you still need to think about these things because non-high-risk areas become high-risk areas when water is used without any notion of stewardship.

What's next in PepsiCo's sustainability journey?

Well, we've got our 2030 goals that are just around the corner. For water use efficiency, we're going to be pursuing "best in class" for our high-water-risk sites and "world class" for our non-high-water-risk sites — recognition of the fact that it's important to take action in non-high-water-risk areas, as well, to your last question.

We're setting those goals not only for PepsiCo operations but for our third-party manufacturers as well, increasing the scope quite significantly. We've set a watershed health goal of replenishing more than 100% of the water that we use by 2030. The objective is to drive down water consumption as much as we can, and whatever amount we do use, we aim to replenish back into the watershed and then some.

From a PepsiCo point of view, we're putting a really strong emphasis on recovery and reuse within the system in an effort to extract the most value out of every single drop. And that's going to be key everywhere — not just at PepsiCo, but for any industry.

It's incumbent upon all stakeholders, really. Whether you're a business, household, government, or NGO, there's a need for us all to act in unison and collaborate to solve the water problem. And we are making progress — we see it everywhere. But I would probably suggest that both the pace and scale need to increase, for everyone. I hope the actions we're taking at PepsiCo can serve as inspiration, and we're always looking to bring others along on our journey. ■

Water Innovations

101 Gibraltar Road, Suite 100
Horsham, PA 19044
PH: (215) 675-1800
Email: info@wateronline.com
Website: www.wateronline.com

CHIEF EDITOR
Kevin Westerling
(215) 675-1800 ext. 120
kwesterling@vertmarkets.com

PUBLISHER
Travis Kennedy
(215) 675-1800 ext. 122
tkennedy@vertmarkets.com

PRODUCT MANAGER
Bill King
(215) 675-1800 ext. 100
bking@vertmarkets.com

MANAGING EDITOR
Karen White
(814) 897-9000 ext. 316
kwhite@vertmarkets.com

CREATIVE DIRECTOR
William Pompilii
(215) 675-1800 ext. 145
bpompilii@vertmarkets.com

DIRECTOR OF ONLINE DEVELOPMENT
Art Glenn
aglenn@vertmarkets.com

Funding The Fight Against PFAS And Lead In Drinking Water

An overview of funding opportunities for water utilities to meet new and upcoming compliance objectives, as well as technology considerations to reduce further contamination.

By Katie Brenneman

Safe drinking water is a right for all individuals. Unfortunately, access to clean drinking water is challenging due to the presence of per- and polyfluoroalkyl substances (PFAS) and lead, which pose significant health threats to the public. Also known as "forever chemicals," PFAS have a lasting environmental impact due to their persistent nature. Lead, a toxic metal, is found in water systems worldwide; immediate action is required to address and remove it. The financial challenges of upgrading infrastructure to meet regulations and eradicate these pollutants are substantial, and this obstacle often prevents governments, businesses, and organizations from cleaning up drinking water systems.

This article offers guidance to water utilities seeking support for the expenses associated with PFAS and lead removal, including exploring grants, state assistance programs, and private funding opportunities. Furthermore, it will explore how manufacturing companies can significantly reduce PFAS in waterbodies through advanced machine learning and predictive maintenance technologies.

Federal Grants And Resources

A range of financial resources and grants are available to support the remediation of water infrastructure and public drinking water systems. Here are some options for water utilities and municipalities to supplement support for cleaner water systems.

The Infrastructure Investment and Jobs Act

In 2021, Congress signed the Infrastructure Investment and Jobs Act[1] (IIJA) into law, allocating $50 billion to repair and clean water infrastructures. In particular, the IIJA includes funds for:

- Reauthorizing grant programs for the development of green stormwater infrastructure programs and wastewater treatment systems;
- Addressing aging infrastructure, including water recycling and reuse, drought contingency plans, and water storage;
- Enabling lead pipe replacement to remove and replace lead service pipes, upgrading water storage facilities, and improving water distribution;
- Advocating for affordability and equity in water infrastructure serving disadvantaged or rural communities struggling to afford water system improvements.

The law explicitly funds the remediation of pollutants such as PFAS and lead from drinking water systems. The IIJA protects public health and builds healthier communities by improving water quality.

Municipalities and water utilities can apply for support for water infrastructure remediation projects through the Clean Water State Revolving Fund, FEMA Hazard Mitigation programs, or the Drinking Water State Revolving Fund.

Clean Water State Revolving Fund

Another funding option for water utilities is the Clean Water State Revolving Fund[2] (CWSRF), a federal-state partnership offering low-cost financing to communities for the following water infrastructure projects:

- Decentralized waste treatment systems
- Green infrastructure
- Municipal wastewater facilities
- Pollution control
- Stormwater runoff mitigation
- Water reuse
- Estuary protection
- Decentralized wastewater treatment systems

The CWSRF offers loans and loan guarantees, insurance, debt purchase or refinancing, SRF revenue debt guarantee, and additional subsidizations. Utilities can contact their respective state's CWSRF program for information on how to apply.

EPA's Drinking Water State Revolving Fund

Established in 1996, the U.S. EPA's Drinking Water State Revolving Fund[3] (DWSRF) offers another funding option for water utilities. It creates a financial assistance program to help water utilities in all 50 states achieve federally regulated health protection objectives. This fund is particularly essential for water systems that need chemical contaminants and lead removal. Utilities can apply for their respective state's dedicated revolving loan fund, which, when repaid, goes back into the revolving fund. Under the DWSRF, states offer various forms of assistance, including:

- Loans
- Purchasing
- Refinancing
- Guaranteeing local debt
- Purchasing bond insurance

States may offer loan repayment periods of up to 30 years and interest rates ranging from zero to market rate; they can also provide customized loans to smaller or disadvantaged communities. Utilities and municipalities should consult with their DWSRF administrator for details on applying and funding requirements.

State Resources And Opportunities

In addition to federal aid, states offer programs specifically designed to assist water utilities in combating contaminants in drinking water. These programs may include grants, loans, and other financial incentives. Utilities should collaborate with their respective state health departments and environmental protection agencies to explore other state-specific funding resources. Another worthwhile funding opportunity is local governments, as some may provide funding programs in localities where water quality issues are prevalent.

Private Funding Options

Aside from federal and state assistance, water utilities can explore private funding options for water infrastructure remediation, especially projects focusing on long-term efficacy and sustainability. Environmental non-governmental organizations (NGOs), foundations, and corporate social responsibility (CSR) programs offer grants for environmental protection projects. Another viable funding option is crowdfunding platforms that raise private funds for specific community-driven projects related to water safety.

Leveraging Technology: The Role Of Manufacturing Companies

Manufacturers that produce or use PFAS contaminants that end up in drinking water can also play a vital role in minimizing the impact of these chemicals and becoming compliant with federal and state regulations. By integrating technologies such as machine learning and predictive maintenance, these manufacturing companies can minimize accidental releases or leaks of PFAS into bodies of water.

Utilizing Machine Learning For Predictive Analysis

Machine learning (ML) algorithms can analyze volumes of data from manufacturing processes to identify operational inefficiencies or potential equipment failures that could result in chemical leaks. Manufacturers using ML also learn to optimize their manufacturing processes through data-informed decision-making.

This proactive approach, combined with a pollution incident response plan[4], enables companies to address issues before they escalate, thus preventing PFAS contamination in water sources and improving productivity and efficiency.

Adapting Predictive Maintenance Technologies

Likewise, predictive maintenance solutions[5] help manufacturers maintain their machinery and equipment, lowering risks associated with malfunctions that may cause lead and PFAS contamination incidents. Through Internet of Things (IoT) technology and sensors, manufacturing companies can monitor the condition of storage tanks, pipelines, and other critical infrastructure elements. Predictive maintenance tech will alert manufacturers to infrastructural problems before they cause environmental damage.

Engaging With Stakeholders

For water utilities, engaging all stakeholders in clean water systems is critical in the fight against lead and PFAS contamination[6]. This engagement should not focus solely on fundraising but should also address creating partnerships with environmental groups, community organizations, regulatory bodies, and the general public. Open collaboration and communication among these parties can make the efforts to improve water quality and ensure community health more effective and far reaching.

Fighting For Clean Water For All

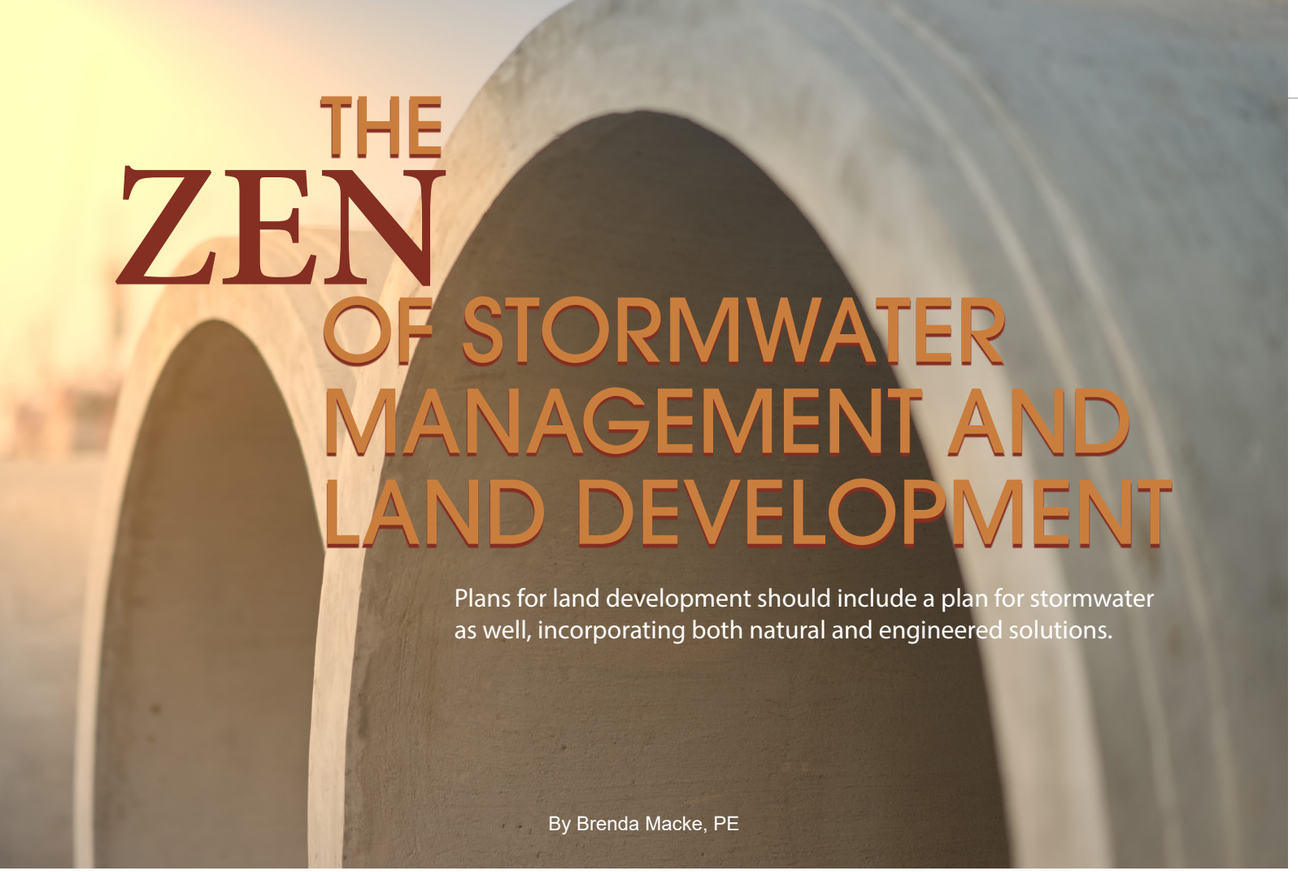
Addressing the challenges posed by PFAS and lead contamination in drinking water requires collective teamwork from various members, including water utilities, government entities, private sector players, and local communities. By utilizing federal and state resources, exploring additional funding opportunities, and adopting innovative technologies, water system manufacturers can prevent water contamination and provide clean water for everyone. ■

References:

1. https://www.congress.gov/bill/117th-congress/house-bill/3684
2. https://www.epa.gov/cwsrf
3. https://www.epa.gov/dwsrf/how-drinking-water-state-revolving-fund-works
4. https://www.themanufacturer.com/articles/new-findings-reveal-the-role-manufacturing-industry-may-be-playing-in-the-countrys-clean-water-challenges/
5. https://www.bradyid.com/resources/predictive-maintenance
6. https://www.whitehouse.gov/briefing-room/statements-releases/2023/03/14/fact-sheet-biden-harris-administration-takes-new-action-to-protect-communities-from-pfas-pollution/

About The Author

Katie Brenneman is a freelance writer and regular contributor to *Water Online,* covering environmental, technology, and utility management issues. She can be reached at katiebrennemanwrites@gmail.com.



THE ZEN OF STORMWATER MANAGEMENT AND LAND DEVELOPMENT

Plans for land development should include a plan for stormwater as well, incorporating both natural and engineered solutions.

By Brenda Macke, PE

Every natural piece of land has already mastered and optimized the flow of its stormwater using resources such as trees, rocks, soil, and grasses. Although rainfall runoff certainly occurs, much of the water is accommodated through infiltration, absorption, or evaporation. Mother Nature knows what she's doing.

Land development projects alter the land's associated natural water flows and the environments in which these flows discharge. Humans impact the land, and the land goes on to affect the water that, in turn, alters the land. Managing this cycle requires constant reevaluation and vigilance to understand the impact and identify the desired outcomes.

Land Development

In urban environments, stormwater flows originate from snowmelt and rain and are designed to be channeled away over parking lots, concrete, and other impervious surfaces. Any land development project must manage the rainfall runoff and control the flow's impact downstream for both small and large storms.

Whether land improvement is from a greenfield or redevelopment project, the land parcel is typically stripped before the building phase begins. There are other construction options, but developers and contractors look for a clean slate where they can build most efficiently. The land will change, and although design criteria for new projects strive to mimic the previous environment, it is often not achievable.

Land development has many positive outcomes for societies and communities, and if we plan and develop carefully, it can have a positive impact on the natural processes and the land as well. What follows is a rundown of the process.

Project Teams

The land development process typically involves a development team and a city and/or agency process team.

The development team focuses on surveying, engineering, and constructing the project for the landowner. City teams focus on enforcing planning, public works, and public safety criteria that must be met according to the community's regulations. Both teams steer development projects through ordinances, design criteria, and permits.

Every land development project has an established set of goals and requirements. The developer and city process teams work toward meeting these defined expectations to meet the desired development and the corresponding regulations.

Planning Review

Land development projects often start with a planning review where a plat is overlaid on the site and changes to the land become evident. This is the first glimpse of what the changes to the land would be.

This review helps to identify existing flood plains, detention requirements, easements, and land access. While the natural systems that moved the water flow in the past will be seen with an overlay of proposed changes, there often needs to be more consideration of stormwater at this stage.

Permitting

At this stage, engineers submit plans for transportation, stormwater, and other public improvements. Overland flow paths identify the existing natural water flows on the site. Next, an overlay of buildings, structures, and impervious areas is introduced. It becomes apparent how humans will alter and control the water flow with this new land use.

Stormwater management techniques for developed land can include enclosing overland flow paths, developing detention and retention facilities, and identifying storage options, vaults, and more. However, the focus is often on how the developed land will be used, not on how rainfall runoff can be generated and used by the land.

At this stage, the goal is to get the necessary permits so the project can get underway.

Realizing Resilient Watersheds

Land development projects add impermeable roads, structures, roofs, sidewalks, and parking lots. Land development also reduces natural vegetation cover, including grasses, trees, and brush. In addition, development alters or eliminates the existing natural water flows and drives increased surface runoff volume.

As land development projects progress and address the challenge of moving stormwater, it is time to consider what will be built and what will be preserved — not just to keep moving and using stormwater on a site but also for the benefit of all downstream.

By adopting proactive design standards, weighing downstream risk, and embracing stormwater management early, land development projects can create success for all.

Develop Design Standards

Stormwater design standards consider the intensity-duration-frequency (IDF) of a hypothetical rainfall event. This hypothetical rainfall event has only one peak — like a bell curve — and lasts a defined timeframe, such as 24 hours. Unfortunately, the commonly used IDF standards and existing hydrologic criteria are based on data from the 1960s and focus on severe weather events rather than the changing weather patterns, such as back-to-back rain events that can greatly increase runoff volume. Today, we have historical rainfall data to show how rainstorms happen, including peak intensity and typical durations.

Design standards often provide guidance that is too simplistic for land development projects, focusing only on rerouting runoff and not incorporating all the impacts of weather events.

Assess Downstream Risk

Current design and planning guidance passes the risk of water runoff and flooding downstream. As the land is changed and the existing hyper-efficient natural water flow paths are disrupted, land development projects must take responsibility for the runoff generated by their site to avoid passing on costly problems to surrounding communities. Projects must look beyond simply meeting regulations and provide practical steps for incorporating runoff.

An increase in water flow presents a significant increase in energy and strength. An inaccurate design of runoff mitigation can push flooding downstream, tear up river banks, widen waterways, undermine road crossings, degrade existing stormwater infrastructure, and more.

Understanding and appreciating the natural flow paths and land cover at the project site and beyond is essential to the best long-term stormwater development strategy. Respecting naturally established watersheds and water runoff patterns is an important part of taking a holistic approach toward creating an optimum plan while mitigating unnecessary risk. There are opportunities within the design development phase to integrate stormwater management strategies throughout the land parcel — look for options to infiltrate water, reduce impervious surfaces, integrate diverse vegetation, and retain and reuse water.

Engage Early Collaboration

There is value in understanding, accommodating, and leveraging the way water naturally flowed on a piece of land for centuries. Expanding the land development team to include stormwater management from the start helps create the most effective design plans.

Stormwater should no longer be considered waste that must be removed but a resource that can be incorporated into land development. In addition to focusing on pollutant reduction from runoff mitigation, stormwater management brings a range of tools and solutions that can enhance a development project by using rainfall where it falls.

Smarter stormwater designs explored and incorporated early in a land project can introduce flexible solutions that meet regulations and provide benefits to the landowner and community. Collaboration among planners, engineers, architects, landscape professionals, and scientists can identify and present a range of options that meet the intent of the regulations while building infrastructure that has multiple uses for the community.

Conclusion

Resilient and thoughtfully engineered watershed systems can be an incredible resource. Land development can improve environmental and infrastructure outcomes if we make the effort to learn more innovative design standards, understand the risk to areas at the bottom of the watershed, and embrace stormwater knowledge early in each project. ■

About The Author

Brenda Macke, PE, is a project manager at Burns & McDonnell, specialized in planning and design for resilient infrastructure projects.

Awaiting The Final Lead And Copper Rule Improvements: *WHAT HAPPENS NEXT?*

From "Revisions" to "Improvements," the EPA is making further changes to the *Lead and Copper Rule* to keep drinking water systems working toward the ultimate goal.

By Brendan O'Brien

Over the past few years, community and public water systems have been focused on meeting the October 2024 deadline of building their service line inventories as directed by the U.S. *EPA's Lead and Copper Rule Revisions* (LCRR).

But late last November, the EPA's highly anticipated *Lead and Copper Rule Improvements* (LCRI) was released in draft form. Utilities, agencies, and consultants had until February 5, 2024, to submit comments, and the EPA Office of Water is now sifting through those comments and working to release the final LCRI.

So now what happens, and how can water utilities prepare for the final LCRI?

There are many important details that answer this question, but to summarize, LCRR will roll into the LCRI — the next stage of the process in the *Lead and Copper Rule* regulatory journey. While we understand changes could still be made to LCRI as the EPA reviews public comments, we know that additional requirements are coming and that all community and public water systems will need to comply.

What To Know

Three components in the LCRR will take effect October 16, 2024. Those are as follows:

- Submit an initial service line inventory to your state regulatory agency. The inventory must be available publicly. For water systems serving more than 50,000 people, the inventory must be provided online.
- Within 30 days after submission, provide notification to people served by the water system at the service connections with a lead, galvanized requiring replacement (GRR), or lead status unknown service line. Delivery must be by mail or by another state-approved method.
- Notify all customers within 24 hours following a lead action level exceedance (15 parts per billion).

Once water systems satisfy the LCRR requirements this October, it will be time to plan for the next stage as LCRI comes into play. However, the timing of the final LCRI is still unknown.

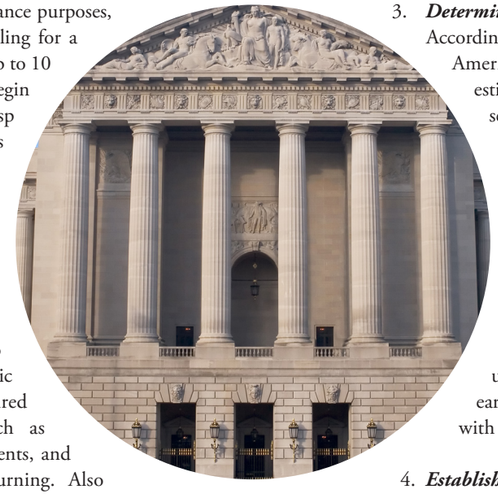
The various compliance deadlines in the proposed LCRI stretch out anywhere from three to 10 years after the final rule goes into effect. One of the key pieces to the LCRI is that it will require every community water system to submit a baseline inventory within three years after the final rule becomes effective (expected late 2027), in addition to the service line inventory due this October under LCRR.

The baseline inventory must include the material of the goosenecks or connectors that make up each service line. We advise water systems to begin capturing gooseneck material right away during records review and any field work tasks as they build their initial inventory. In addition, this allows utilities to keep tackling the "lead status unknowns" that end up being submitted within the initial inventory.

Why is this important? Well, the baseline inventory will determine the replacement rate, in which systems will have to remove all lead, GRRs, and unknowns from their systems between 2027 and 2037.

The LCRI intends to push the lead service line replacement (LSLR) plan deadline to late 2027. However, some states may still require it to be submitted in 2024 — so check with your state regulatory agency. The nationwide goal is that all lead service lines (and goosenecks) and GRRs can be replaced at a rate of about 10% per year for 10 years, resulting in total replacement.

Another major proposed requirement within the LCRI is an improved tap sampling program. Under the LCR and LCRR, systems are required to sample first draw (first liter) from home taps when performing lead and copper sampling. However, the LCRI intends to require systems to collect first- and fifth-liter samples for lead P90 levels. The higher result from the two samples will be used for compliance purposes, and on top of that the LCRI is calling for a reduced lead action level from 15 ppb to 10 ppb. We recommend that utilities begin piloting this process so they can grasp an idea of what their new P90 levels will be when compliance begins in 2027. If there is a concern that your utility will be near the new 10 ppb threshold, you have time now to implement corrosion control measures, where applicable.



Additional public outreach and education requirements will also come into play under LCRI. Public outreach materials will be required for daily typical operations, such as potholing activities, meter replacements, and corporation/curb stop or valve turning. Also included is a proposed procedure for sampling results, which should be postmarked within three calendar days, and required information documents related to replacements. Public outreach will also be required for planned or emergency work, meter replacement, and more.

We encourage utilities and public water systems to keep costs and planning for public outreach in mind as they develop their compliance plans.

How To Prepare

While it may feel like 2027 (and beyond) is a long time from now, it's best for public water systems to remain proactive. So, what can you do to prepare for the changes that LCRI will likely bring?

1. ***Reduce unknowns.***
   One of the keys to timely, successful service line replacement and compliance with LCRI is to reduce "unknowns." Any unknowns remaining by the time of submission of the baseline inventory will be included in your replacement target (10% per year). Unknowns will be required to be replaced, so the more data available for a system, the more accurate and cost-effective the LSLR plan can be.

2. ***Discontinue partial replacements.***
   Once the LCRI compliance date goes into effect, partial service line replacements will no longer be allowed under a LSLR program. The utility is required to make a "reasonable effort" with four attempts using at least two different modes of communication to reach out to customers for a private side replacement. If a customer declines, the utility is not permitted to make a partial replacement of their utility-owned side of the service line. The only exception to this is when there's an emergency or during planned infrastructure work (such as water main replacement).

3. ***Determine your funding strategy.***
   According to a recent statement from the American Water Works Association, it's estimated that replacement of all lead service lines in the U.S. could top $90 billion. The EPA has designated $15 billion from 2022-2026 ($3 billion per year for five years) for lead service line inventory development and lead or GRR service line replacements. Each state will have programs to administer the money, and each state gets to decide how it is administered. We recommend utilities research funding options as early as possible, and if necessary, partner with a consultant that can help.

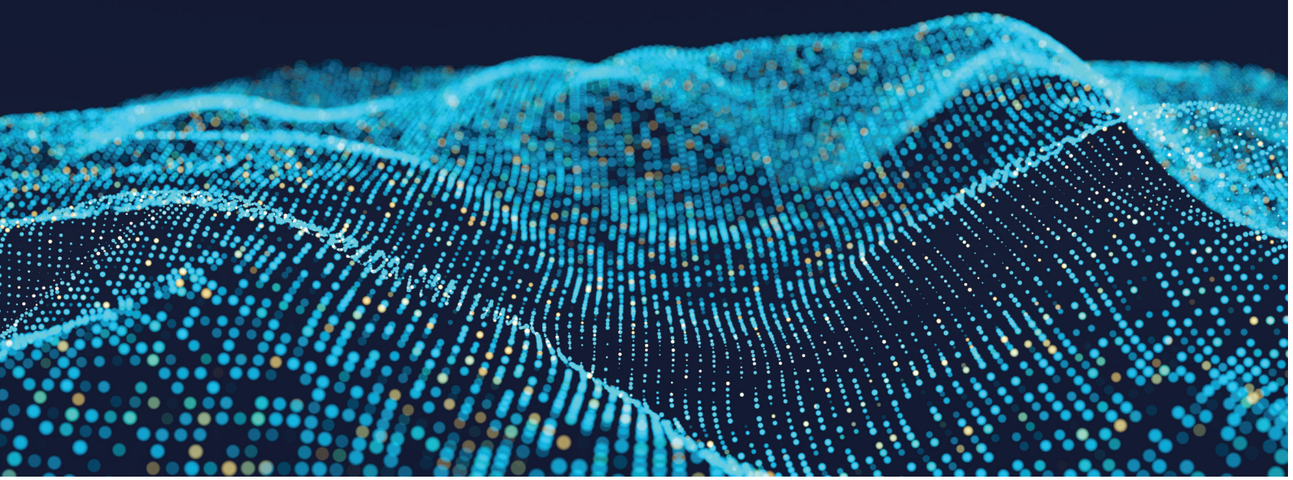
4. ***Establish new sampling programs.***
   Launching a sampling pilot program will be crucial during this stage to ensure future compliance when the action level is lowered to 10 ppb. If there is a lead action level exceedance, the public must be notified within 24 hours (beginning October 16, 2024, at 15 ppb). Additionally, utilities that are prepared can begin performing sampling at schools and registered childcares prior to 2027. Consider checking with your state to learn whether school programs in your service area have utilized the "Water Infrastructure Improvements for the Nation" (WIIN) 2107 grant program. The EPA awarded $58 million in WIIN grant funding for FY 2022 and FY 2023.

As LCRI sets additional expectations, many public water systems recognize the major undertaking ahead. But with proper preparation, smart funding strategies, and ongoing planning, we are confident water systems of all sizes across the U.S. will be able to comply successfully. ■

About The Author

Brendan O'Brien, PE, is a project manager at Stantec with 10 years of engineering experience in the delivery of water, wastewater, and stormwater distribution and conveyance system design, and construction projects. O'Brien leads Stantec's *Lead and Copper Rule Revisions* (LCRR) Growth Initiative team and is currently managing several LCRR inventory projects for clients small and large nationwide.

How Monitoring Treatment Processes Drives Efficiency And Confidence



By Amanda Tyndall

Climate change, consumer confidence, and emerging contaminants add to the challenges of water treatment. Rising costs of improved treatment, including both equipment and chemicals, make it even more important for plants to operate efficiently. How do you know if treatment is effective or when is best to replace or maintain equipment? New advancements in sensors, instrumentation, and digital enablement are providing more data. There are countless benefits of more data for better asset management, leak detection, and treatment control. Additionally, artificial intelligence is emerging with hopes of not only alerting but also predicting performance. Yet, even with the potential for more data, faster data, and predictive data, it remains true that the best data are data that bring confidence in treatment and compliance.

Data-Driven Results

A water utility in the Western U.S. treats groundwater and surface water across three facilities. All three facilities have highly variable seasonal demands and limited operational space, posing challenges related to treatment decisions across seasons or following events that impact water quality. One out of the three plants is conventional, using coagulation and filtration. It has a throughput capacity of 10 million gallons per day (MGD), with average summer flows of 5 MGD and 2.5 MGD in the winter. To better understand and optimize coagulant dosing, the facility decided to investigate how water quality data could be used to generate predictive algorithms for better control and deeper insights. Ultimately, the plant wanted its operators to feel confident to adjust treatment using data-driven decisions. This would lead to more efficient treatment and better environmental protection.

With large seasonal swings in temperature, flows, and water quality, the facility requires accurate data to drive decision-making. Using water quality data from parameters such as alkalinity, total organic carbon (TOC), and turbidity, the facility can ensure effluent compliance and confidence in processes. For example, when spring runoff starts, turbidity tends to spike, then return to base levels, but TOC spikes and remains high. At these points, the plant needs to decide whether to use its surface water or groundwater wells. By using TOC data, this decision is made quickly and with confidence. This confidence from the operators also ensures consumer confidence by providing compliant and quality water year-round, even in the case of sudden changes in source water from storms or seasonal changes.

Treatment includes the use of a variety of chemicals at each step of the process for pre-oxidation and coagulation, as well as a coagulant aid and polymer for prefiltration. These treatment steps maintain turbidity requirements per the plant's original design, while the addition of TOC analysis confirms disinfectant/disinfection byproduct rules (DBPRs) compliance. In the past, the plant conducted various jar tests to determine proper coagulant dosing. This placed extra pressure on operators and did not provide real-time information on raw or finished water quality. Moving to online analysis provided real-time data to immediately react to changes in source water and treatment performance. One example action is using TOC levels in the effluent to prompt a change in operations. When TOC increases during runoff, that signals the plant to reduce production and rely on groundwater sources.

Data were collected over the course of several years using raw and finished water quality. The data were used to optimize primary coagulant dose and identify correlations that would help predict performance. Results indicated a strong linear correlation between raw TOC and coagulant requirements. Weaker correlations were determined between alkalinity and turbidity with coagulant. Later studies improved the regression equations to solely relate dosage to incoming TOC. The plant still uses the regression that associates TOC, turbidity, and alkalinity. The variability with turbidity and alkalinity assists with coagulant dose adjustments during rapidly changing water quality events like rapid snowmelt and rainstorms. While the plant is not equipped for 100% automation, these water quality data allow operators to adjust using data-driven decisions.

Intakes are located on a river, so raw water quality can change drastically from hour to hour and requires multiple coagulant dose changes each day. Using raw TOC, alkalinity, and turbidity, the drinking water facility has been able to accurately adjust chemical doses for late summer turbidity spikes caused by rainstorms, as well as seasonal TOC and alkalinity changes from mountain runoff. Using data to drive decisions and confirm compliance enables more efficient treatment and ultimately better human and environmental protection. TOC analysis guides seasonal operations and delivers confidence in coagulant dosing decisions at this plant.

Conclusion

Drinking water plants must meet local and federal regulatory requirements, and they must now do so with emerging contaminants and variable source water quality requirements. Rivers, lakes, and aquifers used to be more predictable, but due to storm events and water scarcity, it is now more challenging for municipal treatment plants to achieve compliance. Ultimately, water quality monitoring can help utilities understand the changes in source water quality and what treatments are needed to adjust to the changes. The most useful data are often obtained when operators can use instrumentation data on water quality to not only optimize treatment and save costs but also to have confidence that they are making profitable decisions and staying in compliance. ■

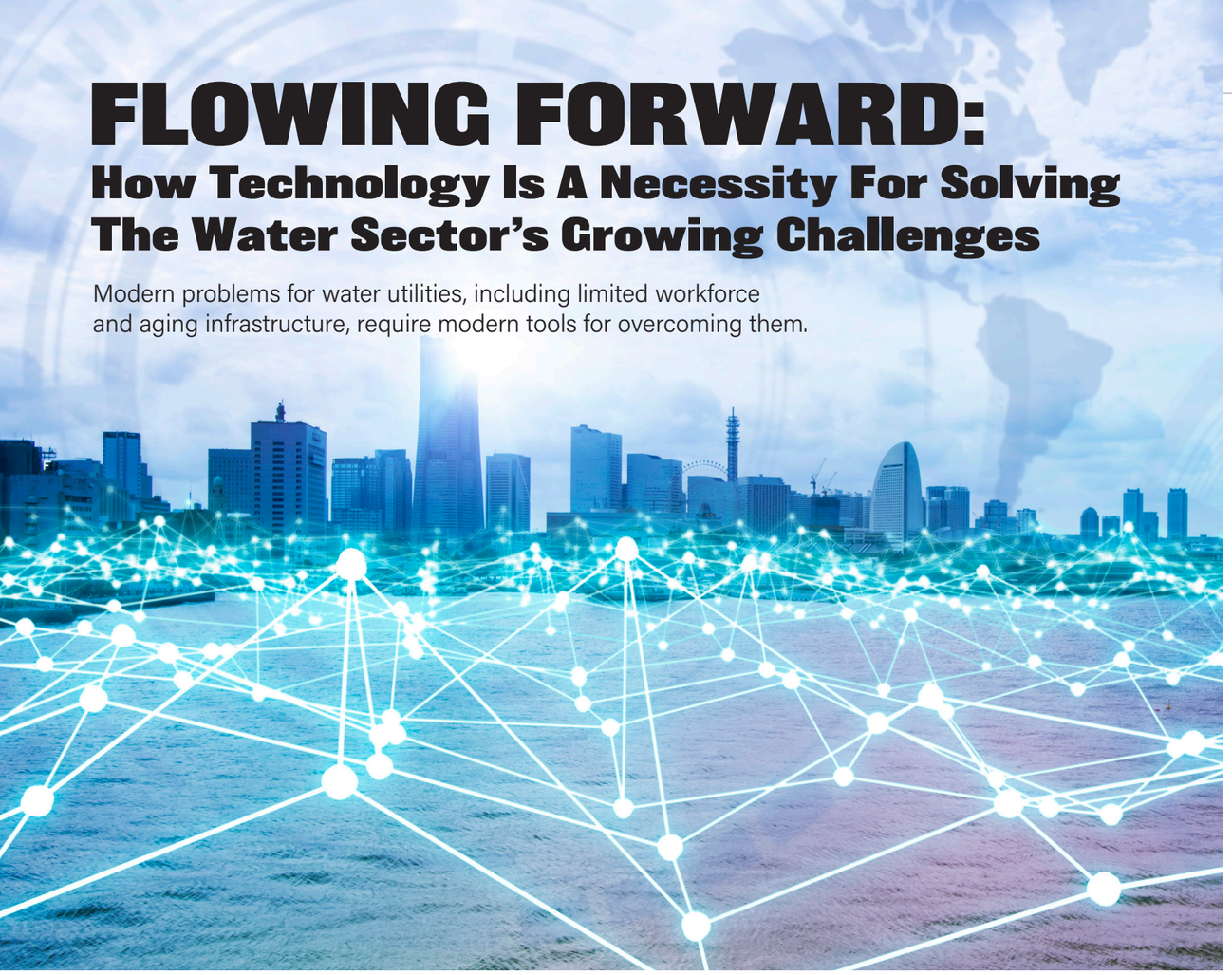
About The Author

Amanda Tyndall is the vertical market manager for Industrial & environmental markets at Veolia Water Technologies & Solutions, focusing on the Sievers product line of analytical instruments. With 10 years' experience in the water industry, Amanda and her team partner with industries and municipalities to solve water quality challenges through instrumentation solutions for ultrapure water to wastewater. Her background is in chemical engineering, with a bachelor's degree from Vanderbilt University and a master's degree from the University of Cambridge.

FLOWING FORWARD:

How Technology Is A Necessity For Solving The Water Sector's Growing Challenges

Modern problems for water utilities, including limited workforce and aging infrastructure, require modern tools for overcoming them.



By Chad Hall

According to the U.S. Bureau of Labor Statistics, employment of water and wastewater treatment plant and system operators is projected to decline 6% from 2022 to 2032[1]. Meanwhile, the deterioration of water infrastructure adds to the urgency of finding effective solutions, especially as 6 billion gallons of treated water are estimated to be lost every day in the U.S. due to leaks, with approximately 240,000 water main breaks occurring annually[2].

To tackle these two pressing challenges and empower a mission-critical workforce, water utilities are increasingly turning to digitalization. By harnessing the power of digital technologies, utility companies can enhance operational efficiency and resilience. From real-time record-keeping to reliable connectivity and security protocols, the adoption of digital solutions — particularly rugged mobile solutions — can serve as a valuable tool for workers on the front lines grappling with these challenges.

Streamlining Operations And Improving Record-Keeping

One significant area where digitalization makes a difference is in streamlining operations and improving record-keeping. Historically, water utility workers used paper-based record systems to document meter readings and maintenance activities. However, this method posed challenges because the data could be misplaced or fall subject to a variety of elements impacting readability and accuracy, such as spills and rips. This method also caused delays in inputting information into computer systems, often located at an office miles away.

To address these inefficiencies, water utility companies are now integrating rugged mobile technology into their daily routines. This advancement allows water technicians to digitize and automate previously manual tasks, such as meter readings and asset inspections. Equipped with devices designed to withstand any environment, workers can streamline record-keeping, ensuring data reliability and accuracy. Ultimately, this integration empowers workers to accomplish more in less time, enhancing overall operational effectiveness and service quality, while speeding up the time it takes to analyze and act on data across the organization.

Water treatment plants and pumping stations in remote areas often have unstable connectivity, making data collection and analysis difficult to do on the job.

Providing Reliable Connectivity Outside Of The Office

Water treatment plants and pumping stations in remote areas often have unstable connectivity, making data collection and analysis difficult to do on the job. If a technician is conducting a routine maintenance check on a pipeline and identifies a series of leaks, they must be able to solve the problem quickly by communicating details in real-time such as the precise location, size, and severity. This is a critical element of both short-term repairs and longer-term prioritization of fixing aging infrastructure.

Utility workers must be equipped with devices that have multiple connectivity options, such as Wi-Fi, 4G LTE, 5G, and Bluetooth. These ensure reliability, even in areas where signals may be obstructed by large machinery like water pumps and sedimentation tanks. Access to real-time intelligence or the ability to quickly access maps, blueprints, manuals, and more enables workers to make informed decisions onsite, preventing minor issues from escalating into significant problems.

Truly reliable connectivity can also help optimize water technicians' routes and schedules. For instance, if a worker is conducting routine maintenance near a recently detected leak, utilities can look at the big picture and send immediate notifications, directing the closest worker to the leak. This approach minimizes response times and maximizes resource utilization, giving teams heightened visibility into where staff, materials, and machinery are in the field.

Maintaining Security On The Go

Ensuring security while on the move is crucial as water utilities become more interconnected. Water is a vital resource, and its infrastructure is of critical importance. Water and wastewater systems are susceptible to cyber threats, emphasizing the importance of devices that facilitate the implementation and auditing of security best practices. These devices must enable swift identification of intrusions and provide alerts to experts capable of mitigating potential attacks to maintain the resilience of these systems. That's why the devices that workers use must meet strict security standards and have required checks to ensure they incorporate the latest security measures.

Devices with built-in security features like fingerprint scanning and multi-factor authentication can help reduce potential risks. By integrating these features, the need for employees to repeatedly input lengthy passwords is eliminated, ultimately reducing downtime and enhancing overall efficiency. These security measures enable workers and companies to prioritize their core mission: maintaining the security and cleanliness of water for their communities.

Facilitating A True Partnership

Fostering a true partnership between utility companies and technology providers is essential for water utility operations. Utility companies must carefully select a technology partner capable of delivering comprehensive services and support, from the initial deployment through the entire lifespan of its devices. Rugged devices are designed to be long-lasting and high-performance, staying in rotation for upwards of five to seven years, which helps to reduce e-waste. Consumer devices have a shorter lifespan and therefore are more frequently outdated and recycled. And, given the constraints of limited IT resources, partnership is key to effectively deploying and managing advanced technology.

Experienced technology partners offer a range of services tailored to the specific needs of utility companies. Whether it's proving an extension of existing IT teams, assisting with software installation, or offering expertise in evaluating various deployment models to help lower costs, technology partners play an important role in driving efficiency and innovation across water utility companies.

As the U.S. continues to digitize, utility and technology companies must work together to equip frontline workers with the devices they need. By prioritizing workers' needs, utility and technology companies can work together to navigate the evolving landscape efficiently, productively, and with confidence. ■

References:

1. https://www.bls.gov/ooh/production/water-and-wastewater-treatment-plant-and-system-operators.htm#tab-6
2. https://www.mod-eng.com/all-you-need-to-know-about-americas-aging-water-infrastructure-crisis/

About The Author

Chad Hall serves as executive business development manager at Panasonic Connect, overseeing the development of rugged mobile solutions to support the utilities sector. He obtained his bachelor's degree in geography and master's degree in geographic information science and cartography from Texas State University.

AQUA FROM THE AIR:

The Promise Of Fog Harvesting For Clean Water Access

The answer to water scarcity could be right in front of us — and above and all around — if the technology of drawing water from the atmosphere can be made practical.

By Ellie Gabel

Fog harvesting represents an innovative approach to water collection. It harnesses the moisture in fog through specialized nets or collectors to provide a sustainable source of clean water. This method is gaining traction among industry professionals in the U.S. who are interested in exploring novel and eco-friendly solutions to meet the country's growing water demands.

As concerns over water scarcity intensify, the push toward adopting such cutting-edge technologies reflects a broader shift to more sustainable and efficient water management practices nationwide.

The Science Of Fog Harvesting

About 4 billion people globally[1] experience severe water shortages for at least one month every year. This critical situation underscores the urgent need for innovative solutions like fog harvesting, which offers a lifeline by capturing atmospheric water.

Fog harvesting operates on a simple yet effective principle: using specialized nets or collectors to trap and condense fog droplets, which are collected and stored. This technology thrives in areas with frequent fog and minimal rainfall, requiring specific atmospheric conditions — cool temperatures and high humidity — to function optimally.

The effectiveness of fog harvesting systems largely depends on the materials and designs of the nets. They're typically made of polyethylene or nylon for their durability and hydrophobic properties. Designs vary from simple flat nets to more complex structures optimized for maximum efficiency.

Moreover, metals are crucial in enhancing these systems, and they have three common forms[2]: perforated metal, expanded metal, and wire mesh. Each type offers unique benefits in terms of durability, filtration capabilities, and water collection efficiency. Together, these materials and designs form the backbone of fog harvesting technology, promising a sustainable water source for those in dire need.

From an economic perspective, water utilities stand to gain through cost savings and reduced dependence on traditional, often expensive water sources.

Potential In The U.S.

The most promising U.S. regions for fog harvesting are coastal areas and high-altitude locations, where the specific conditions for collection are prevalent. The highest elevation in the country is Denali, AK, soaring over 20,310 feet[3] above sea level.

Meanwhile, Mount Whitney in California is the highest point in the contiguous U.S., reaching over 14,400 feet. These areas, the foggy coastlines of the Pacific Northwest, and parts of California present ideal settings for fog harvesting projects.

Several research initiatives and pilot programs are exploring the viability and efficiency of fog harvesting as a sustainable water source. These projects aim to refine collection technology and methods and make it a more accessible and practical water source for communities in these regions.

Environmental And Economic Benefits

Fog harvesting offers significant environmental advantages, marking a pivotal shift toward sustainable water management with a minimal ecological footprint. For example, capturing atmospheric water reduces reliance on groundwater and surface sources. It alleviates pressure on these increasingly scarce resources.

Moreover, applying fog water for irrigation enhances saplings' growth rates and survivability[4] in reforestation projects, which contributes to ecological restoration and carbon sequestration efforts.

From an economic perspective, water utilities stand to gain through cost savings and reduced dependence on traditional, often expensive water sources. Implementing fog harvesting technology can lead to a more diversified and resilient water supply system. It buffers against drought and scarcity while promoting environmental stewardship and sustainable development.

Integrating Fog Harvesting Into Water Management Strategies

Professionals can integrate fog harvesting into broad water resource management and sustainability strategies by conducting feasibility studies in regions with high fog occurrence. This approach assesses the potential yield and impact on local water supplies.

Moreover, encouraging collaboration among government agencies, research institutions, and private sector partners is crucial in advancing fog harvesting technologies. Such partnerships can facilitate knowledge sharing, technical expertise, and funding, driving innovation in fog collection methods and materials.

Technical Challenges And Innovation

This technology faces technical challenges, including varying fog densities and the necessity for expansive collection areas to yield significant water volumes. Funding uncertainties and often a lack of support from local governments exacerbate these complexities, which can stall or halt fog water collection[5] projects.

However, recent technological advancements and engineering solutions are beginning to overcome these hurdles. Innovations like improved net materials and the development of scalable, modular systems make fog harvesting feasible and efficient.

Additionally, integrating smart technology for monitoring and optimizing fog collection in real time offers promise for enhancing the viability and effectiveness of harvesting systems. They ensure they can become a reliable, sustainable water resource management component.

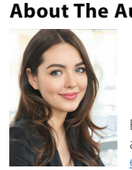
Exploring Sustainable Water Solutions

Industry professionals must explore and champion fog harvesting and other sustainable water technologies to recognize their potential to address scarcity and contribute to a sustainable future. Advocating these innovative solutions can lead the way in transforming water resource management and ensuring a resilient supply for generations to come. ■

References:

1. https://www.unicef.org/wash/water-scarcity
2. https://www.hendrickcorp.com/blog/perforated-metal-vs-wire-mesh-and-expanded-metal/
3. https://www.statista.com/statistics/203932/highest-points-in-the-united-states-by-state/
4. https://www.researchgate.net/publication/257479318_Fog_water_as_an_alternative_and_sustainable_water_resource
5. https://www.frontiersin.org/journals/water/articles/10.3389/frwa.2021.675269/full

About The Author



Ellie Gabel is a science writer specializing in environmental science and innovative technologies. She can be reached at ellie@revolutionized.com.

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