Regenerative Water: A primer to the “net-new” water landscape

Executive Summary

When we talk to the broader business community about Kreneon, the concept of “net-new” water, or regenerative water is foreign to many. This white paper provide an overview of various technologies in the landscape, the innovations that are leading to the market’s expansive growth, and current trends. Each of these domains are areas in which substantial research and private innovation is pioneering new more efficient and effective solutions to address global water scarcity.

The global economy is operating in a state of "water bankruptcy," with a projected **40% freshwater deficit by 2030**. This represents a systemic risk to **$58 trillion in global GDP**—approximately 60% of total economic output. The primary approaches to “Regenerative Water, or “Net-New” water are:

- Desalination - converting sea water, or salinated water through industrial processes, into drinking (potable) or industrial reuse water standards.
- Atmospheric Water Generation (AWG) or Atmospheric Water Harvesting (AWH) means just what is sounds like - pulling water out to air.
- Wastewater to Potable water remediation - this is by far the most common and most established form of regenerative water activity. Industrial production or contamination has long pioneered various technologies for cleaning up wastewater created either through industrial processes or through human waste management systems.
    - This domain has become more complicated however due to “forever chemicals” such as PFAS and innovative new technologies continue to be deployed to address these challenges.

Despite the availability of regenerative technologies, capital remains sidelined due to a "trust gap" caused by legacy manual monitoring and self-reported data. Kreneon aims to resolve this by building the market infrastructure for verified outcomes, transforming "ghost assets" into tradeable commodities.

	Market Size $ USD in ‘25	**Market Growth**	**Production Costs $ USD/M^3**
Desalinization	$19B	11%	$0.41 to $1.50

AWG	$3B	25%	$10 to $26, which is expected to drop significantly as market matures
Wastewater cleanup	$20B	12%	$.45
Industrial wastewater remediation	$48B, of which $20B is likely an overlap above	6%	$.39 to $2.00

Domain A: Desalination (Sea & Brackish)

Market Dynamics

- **Market Size & Volume**: The global desalination equipment market is valued at approximately **$19.23 billion** in 2025 and is projected to reach **$21.45 billion** by 2026. Total global capacity is estimated at **34.7 billion m³/year**.
- **Growth Rate**: The sector is expanding at approx **11% Compound Annual Growth Rate (CAGR)** through 2030.
- **Regional Concentration**: The Middle East & Africa (MENA) region dominates the market with a **52.7% share**, housing the world's largest plants like Ras Al Khair (KSA) and Jebel Ali (UAE). Growing hubs include Singapore, China, and coastal US states (CA, TX, FL).
- **Commercial Viability & Cost**: Desalination is a mature, widely deployed technology. Average costs have dropped significantly to approximately **$0.41 to $1.50 per cubic meter**.

Technology

- **Fundamental Approaches**: **Reverse Osmosis (RO)** (membrane-based) and **Thermal Distillation** (evaporative).
- **Differences**: RO is more energy-efficient and cost-effective, while thermal is often used where waste heat is abundant.
- **Pros/Cons**:
    - *Pros*: Unlimited supply source, dependable local water security.
    - *Cons*: Energy-intensive, high brine disposal environmental impact(https://engineeringonline.ucr.edu/blog/what-is-desalination/)].

Domain B: Atmospheric Water Generation (AWG / AWH)

Market Dynamics

- **Market Size & Volume**: Valued between **$2.7 billion and $3.51 billion** in 2025. Production volume is currently small, but rapidly expanding.
- **Growth Rate**: The fastest-growing regenerative area with a **25% CAGR** through 2030. Wet Desiccation/MOF (as discussed below) is expected to grow at an astounding **35% CAGR.**
- **Regional Concentration**: Asia-Pacific leads with a **36% share** (India, China), while North America is the fastest-growing hub (CA, AZ, TX).
- **Commercial Viability & Cost**: Viable for off-grid WASH and specific industrial uses. Costs are higher, roughly **$10 to $26 per cubic meter** (approx. $0.01/L to $0.10/gal)]. We believe based upon standardization, industrial scale and cost curve decline for new materials, we will see the cost of AWG generated water decline dramatically with time.

Technology

- **Fundamental Approaches**: **Cooling Condensation** (mechanical refrigeration) and **Wet Desiccation** (sorbent-based). The primary approach in Wet Desiccation is a relatively new compound called Metal-Organic Framework (MOF) based technology. In fact in 2025 Nobel Prize in Chemistry was awarded to a group of scientists for the impact these new compounds can have.
- **Differences**: Condensation requires more power but is simpler. Consider the water droplets that form on the underside of your pot's lid when you are boiling water. The relative humidity (RH) required for refrigeration/condensation technologies is approximate 30-40%. desiccation can operate in lower humidity. Standard MOFs can operate in RH as low as 20%, but they have been demonstrated to work in RH situations as low as 12% - which is equivalent to many deserts around the world.
- **Pros/Cons**:
    - *Pros*: Very high purity. decentralized/modular, requires no existing water source.
    - *Cons*: Costly, immature market, high energy per liter.

Domain C: Wastewater to Potable/Industrial Water Remediation

Market Dynamics

- **Market Size & Volume**: The global water recycling and reuse capacity is approximately **150 billion m³/yr**. Market value is estimated at **$19.76 billion** in 2024, reaching **$34 billion** by 2033.
- **Growth Rate**: Growing at **11.6% CAGR**.
- **Regional Concentration**: Asia-Pacific holds a **~40% share** (China's "Water Ten Plan"). Europe focuses on circular economy models.
- **Commercial Viability & Cost**: Highly viable. Operational costs are competitive at approximately **$0.45 per cubic meter**.

Technology

- **Fundamental Approaches**: **Membrane Bioreactors (MBR)**, **Sequential Batch Reactors (SBR)**, and **Advanced Oxidation**.
- **Differences**: MBR combines biological treatment and membrane filtration for high-purity output.
- **Pros/Cons**:
    - *Pros*: Lower cost than desal, high scalability, provides "social alpha" subsidies to local communities.
    - *Cons*: High public perception barriers ("toilet-to-tap" stigma).

Domain D: Industrial Wastewater

Market Dynamics

- **Market Size & Volume**: The global industrial wastewater treatment market was valued at approximately **$20.01 billion to $48.5 billion in 2025.** The large range is likely due to counting the wastewater (Domain C) in the $48 Billion estimate.
- **Growth Rate:** Projected CAGR is in the range of **5.5% to 7.6%**. Large-scale facilities often manage inflows exceeding **100,000 liters per day** to support cooling, processing, and cleaning.

- **Regional Concentration**: Market activity is highest in **Asia Pacific (41% share)**, followed by **North America** and **Europe**. Key growth centers include China, India, and the United States, driven by heavy manufacturing and stringent environmental mandates.
- **Commercial Viability**: As referenced above, this market is highly mature for regulatory discharge and "end-of-pipe" treatment. That being said - it remains fairly expensive just to return to non-potable water standards at cost typically ranges from **$0.39 to $0.71 per cubic meter ($/m³)** for operational expenses, though highly complex streams can exceed **$2.00/m³**. Most of the costs in many of these systems tends to be energy costs and therefore the industry continues to innovate to drive greater efficiency and new approaches. Beneficial reuse and **Zero Liquid Discharge (ZLD)** are rapidly emerging, particularly in water-stressed regions, where facilities now aim for **75% to 100% recycling rates** to ensure operational continuity.

Technology

- **Fundamental Approaches**: A multi-stage process including **Physical** (Dissolved Air Flotation, sedimentation), **Biological** (Aerobic/Anaerobic Digestion), and **Tertiary/Advanced** (Membrane Filtration, Reverse Osmosis, and Advanced Oxidation).
- **Differences**: Unlike municipal systems, industrial treatment must be **bespoke and complex** to handle industry-specific toxins like heavy metals, organic solvents, extreme pH levels, and high-intensity chemical oxygen demand.
- **Pros/Cons**:
    - **Pros**: Significant **cost savings** on water procurement; ensures **regulatory compliance**; reduces environmental footprint and enhances **ESG ratings**; provides **water security** in drought-prone areas.
    - **Cons**: **High capital expenditure (CAPEX)** for advanced membrane systems; requires **highly skilled operators**; generates complex sludge or concentrated brine that requires specialized disposal.

Callout - PFAS Remediation / Cleanup

As mentioned above PFAS remediation is of particular industry interest due to it's presence in many high tech manufacturing processes. It is a relatively new domain as significant investment and innovation is being applied to the challenge.

Market Dynamics

- **Market Size**: The global PFAS remediation market is projected to require annual investments of **$16.5 to $50.0 billion** by 2035 specifically for the electronics sector(https://pubs.acs.org/doi/10.1021/acs.est.5c15514)].
- **Growth Rate**: High expected growth due to new EPA standards (4 parts per trillion limit)()].
- **Regional Concentration**: Primarily **North America** (US/Canada) and **Europe** (Germany, UK) due to stringent regulations.
- **Commercial Viability & Cost**: Technologies are viable but expensive. Treatment costs for electronics wastewater range from **$0.12 to $0.25/m³** for Ion-Exchange Resin (IER) and **$0.41 to $0.71/m³** for RO membranes.

Summary

As the global community faces a projected 40% water deficit by 2030, the transition toward a **"net-new" water landscape** is no longer optional but inevitable. This shift is powered by a diverse technological ecosystem operating at a staggering scale, from mature desalination infrastructures producing **34.7B m³/year** to global wastewater recycling capacities of **150B m³/year**. While industrial wastewater treatment continues to expand as a **$48B market** driven by Asia-Pacific's industrialization, the most profound innovation is occurring in AWG. With a **25% CAGR**, AWG is maturing rapidly, led by MOF technologies that can harvest water in hyper-arid conditions below **20% relative humidity**. This technological leap, recently recognized with the **2025 Nobel Prize in Chemistry**, provides a roadmap for water security even in the world's driest regions.

Serving as the foundation for this growing economy is **Kreneon**, a neutral, vendor-agnostic market infrastructure that bridges the industry's legacy "trust gap." By providing verified outcomes across all geographies and sources, Kreneon transforms disparate water assets into tradeable commodities, ensuring that capital can flow efficiently into the critical regenerative projects that will define our water-secure future.

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