

Blue Bonds Lift All Boats

Unlocking Water Infrastructure Capital Through Standardized Blue Bonds

Executive Summary

Global capital markets have deployed \$7.25 trillion in sustainable debt, yet water infrastructure remains severely underfunded, facing a \$13.2 trillion capital backlog. While institutional capital is available, water investments are trapped behind bespoke legal contracts, manual audits, and sub-scale project sizes that don't meet banks' investment threshold.

Therefore, project finance institutions viewed most water infrastructure projects as unbankable. **Kreneon changes that.**

Operating as a regulated digital registry, Kreneon is architected to address the inherent issues that prevent water investment and Blue Bonds from achieving global scale. By introducing standardized contract structures and automated data verification, Kreneon eliminates transaction friction and lowers the project cost of capital. This financial market infrastructure then allows underwriters to pool distributed, sub-scale water into much larger Blue Bonds.

Whether funding industrial reclamation, sustaining rural community pumps, or expanding municipal transport networks, **Kreneon removes the friction for Blue Bonds to lift all boats**; delivering credit committee ready yields and risk, while securing critical water infrastructure worldwide.

1. The Evolution of Green Bonds to Blue Bonds

The Green Bond market began in 2007 when the European Investment Bank issued the first Climate Awareness Bond, followed by the World Bank's first Green Bond in 2008. What started as a small market has grown into a major part of global finance. Total cumulative labeled sustainable bond issuance reached \$7.25 trillion, with Green Bonds making up the vast majority.

While Green Bonds successfully direct capital toward renewable energy and carbon reduction, water infrastructure has not been that lucky. The World Economic Forum

estimates a \$13.2 trillion global water infrastructure funding backlog. To address this gap, financial markets created Blue Bonds; a specialized subset of sustainable bonds designed specifically to fund clean water, wastewater treatment, and ocean conservation.

Originally issued in '18, Blue Bond cumulative issuance has passed [\\$15 billion](#) as investors dabble in increasing solutions addressing water risk; A far cry from the \$1 trillion/yr need that experts forecast. Why? Unlike energy projects, which benefit from standardized Power Purchase Agreements (PPAs) and grid-level metering, water projects suffer from **structural friction** that locks out institutional capital:

- **Fragmented and Bespoke Legal Contracts:** Every water project relies on unique, custom contracts, driving legal, due diligence, and underwriting costs beyond economic viability.
- **Manual Auditing & Unverified Physical Losses:** Water output is audited manually on paper, while network leaks and unmetered usage leave lenders with estimated rather than bankable revenue numbers.
- **Sub-Scale Asset Sizing:** Most distributed water assets require less than \$5 million in capital; far below the \$50M+ minimum ticket size required by institutional bond underwriters.

To scale water infrastructure, financial markets require standardized legal structures or rails and automated data verification to remove friction and bundle small or distributed assets into rated Blue Bonds.

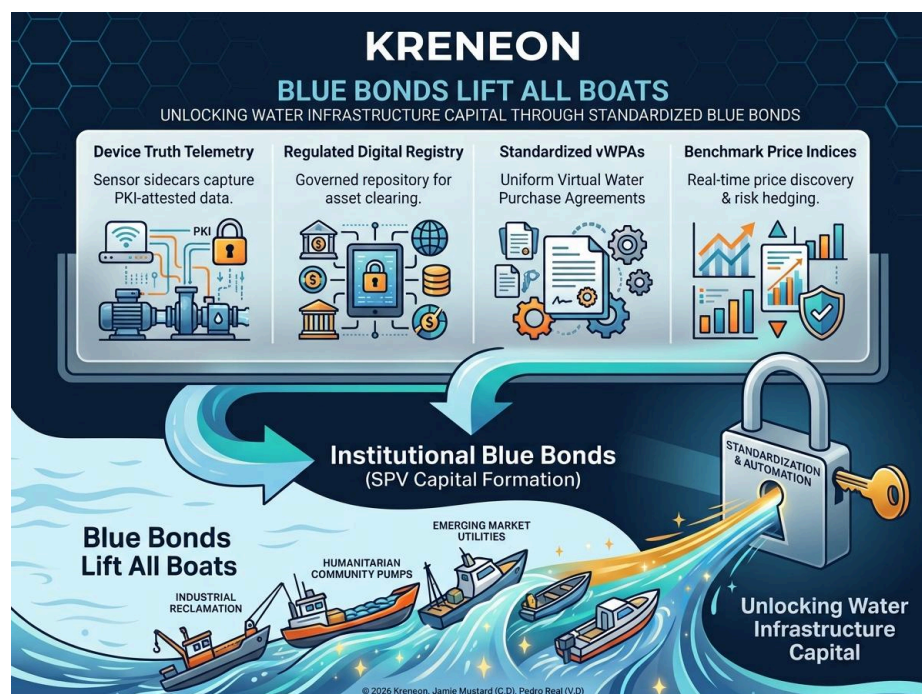
2. Kreneon Platform: Regulated Digital Registry & Standardized Contracts

Kreneon provides the financial market infrastructure to remove transaction friction and enable rapid capital deployment into water infrastructure.

Kreneon operates as a regulated digital registry—a secure data repository governed by global financial regulation. This regulated status gives institutional banks, bond underwriters, and insurers the compliance certainty required to clear financial transactions.

The platform operates across four core pillars:

1. **At the Meter Sensor Telemetry:** Sensor sidecars connect directly to pumps and water treatment devices. They transmit encrypted, tamper-proof operational data (volume, purity, and other required meta-data).
2. **Regulated Digital Registry:** The system records, verifies, and settles all water deliveries and environmental credits on a regulated data repository.
3. **Standardized Virtual Water Purchase Agreements (vWPAs):** Regulated contracts unbundle physical water delivery from financial rights. Buyers and off-takers sign standard vWPAs to fund water projects off-site.
4. **Universal Benchmark Price Indices:** Regional pricing enables real-time price discovery, daily mark-to-market accounting, and financial risk hedging.



By replacing time consuming, expensive audits with at the meter data and replacing custom contracts with standardized vWPAs, Kreneon lowers the Cost of Capital (WACC) for water projects by 200–300 basis points. Standardized contracts can then be bundled across industries, municipalities or regions. This enables institutional underwriters to pool distributed projects into rated Blue Bonds.

3. Industry Use Cases

Use Case 1: Industrial Project Finance (Aggregated Industrial Reclamation)

An industrial operator in South America secured financing for its primary mining operation, but securing water infrastructure debt for regional reclamation and replenishment remained out of reach. While they had a tentative line of sight to fund a single \$15M treatment plant, building out the full project required ten smaller \$1.5M reclamation projects in surrounding communities. Traditional lenders refused to underwrite the smaller sites because legal, audit, and due diligence costs swallowed all potential returns. There was no line of sight to financing the full scope of the project. **Kreneon changes that.**

- **Project Scope & Scale:** One primary anchor industrial facility (\$15M) combined with ten distributed regional recycling plants (\$1.5M each), creating a \$30M total capital footprint.
- **Participating Parties:** Industrial plant operator, corporate off-takers, commercial project finance banks, Special Purpose Vehicle (SPV) managers, and Blue Bond underwriters.
- **Capital Stack:** An off-balance-sheet SPV holds the physical equipment assets. Standardized vWPAs signed by creditworthy corporate off-takers guarantee long-term cash flow floors across all eleven locations.
- **Architecture & Transformation:** Kreneon attaches at the pump telemetry sidecars to all eleven sites. Every site uses identical, regulated vWPA legal terms and automated data feeds. This allows the SPV to pool the ten small projects with the large anchor asset. The combined \$30M portfolio achieves the scale and credit profile required to issue a single institutional Blue Bond.

Use Case 2: Distributed NGO Community Infrastructure (Humanitarian WASH Delivery)

An international humanitarian organization operates clean water programs across rural Sub-Saharan Africa. While donor grants cover the upfront construction of solar-powered water pumps, securing long-term capital to repair and maintain them remains an endless struggle. Nearly half of rural pumps fail within three years due to missing maintenance funds. The organization wanted to raise institutional debt across 1,000 distributed community pumps, but banks could not underwrite thousands of micro-assets with unverified operational data. There was no line of sight to bankable scale. **Kreneon changes that.**

- **Project Scope & Scale:** A network of 1,000 micro-scale community solar water distribution points (\$50k–\$200k per site) across a rural region (e.g., Malawi).

- **Participating Parties:** International NGO (master supplier anchor), hyperscalers or corporate buyers (replenishment and ESG goals), Development Finance Institutions (DFIs), and institutional bondholders.
- **Capital Stack:** Multi-benefit credit creation on Kreneon's regulated data repository. Sensor telemetry measures volumetric water output, social impact metrics, and co-benefit carbon reductions. These other vectors of social good or green benefit can be translated into co-released credits further bolstering the financial viability of the projects.
- **Architecture & Transformation:** Kreneon edge sidecars installed on every rural pump verify daily water output. The NGO acts as the master supplier anchor, using Kreneon's regulated contract rails to pool the 1,000 micro-pumps into an off-balance-sheet SPV. Corporate buyers commit to multi-year credit purchases on Kreneon's regulated digital registry. This credit revenue backs a \$50M institutional Blue Bond, creating steady, automated cash flow to fund pump repairs forever.

Use Case 3: Municipal Infrastructure in an Emerging Market (Public-Private Partnerships)

A rapidly expanding metropolitan utility in an emerging market (e.g., Bangladesh or Lagos) faced a severe water crisis. The city secured conditional private interest for a \$300M bulk water plant, but lacked the debt capacity to finance the 150 kilometers of main distribution pipelines needed to deliver the water. Without pipelines, the treatment plant could not operate, and without guaranteed paying customers, lenders would not fund the pipelines. Local currency inflation made international loans even riskier. The project was completely stalled. **Kreneon changes that.**

- **Project Scope & Scale:** One large-scale regional project (\$300M+) covering bulk water creation plants and primary distribution pipelines.
- **Participating Parties:** Municipal water authority, pension funds, sovereign wealth funds, sovereign state entities, tech hyperscalers, local industrial off-takers, DFIs (first-loss guarantees), and bond market investors.
- **Capital Stack:** Blended capital stack. Hard-currency corporate vWPAs signed by tech hyperscalers combine with DFI credit guarantees, protecting debt payments from local currency inflation.
- **Architecture & Transformation:** Kreneon's telemetry sidecar is installed across production facilities and pipeline transport hubs to measure water volume, pressure, and purity while tracking grid losses. The municipal utility forms a Public-Private Partnership (PPP) SPV. Backed by corporate vWPAs on Kreneon's regulated digital registry, the SPV issues a sovereign PPP Blue

Bond. This raises the upfront capital needed to build both the treatment plant and the distribution grid at the same time.

4. Summary

Structural Water Project Challenge	Kreneon Infrastructure Solution
Fragmented & Bespoke Contracts Every project uses unique legal terms, driving up legal, underwriting, and due diligence costs beyond economic viability.	Standardized Regulated Contracts Provides uniform Virtual Water Purchase Agreements (vWPAs) that unbundle physical water delivery from financial attributes, removing legal friction.
Manual Auditing & Physical Loss Risk Paper-based audits, 6 month lags for reporting, and unmetered network losses (Non-Revenue Water) create audit friction and unverified revenue projections.	At the Meter Sensor Telemetry By capturing data at the meter, Kreneon transmits encrypted, tamper-proof operational data (dMRV) directly to a regulated digital registry.
Sub-Scale Asset Sizing (<\$5M) Most local water assets require under \$5 million in capital, making them too small for institutional bond underwriters requiring \$50M+ ticket sizes.	Portfolio SPV Aggregation Pools cash flows from multiple distributed, sub-scale projects into off-balance-sheet Special Purpose Vehicles (SPVs), with standardized contracts, under girded by regulated data repositories, to enable rated Blue Bond issuance.
Tariff Caps & FX Risk Public water tariffs are politically capped below cost recovery, while local currency drops in emerging markets threaten hard-currency debt payments.	Hard-Currency Corporate Off-Take Secures long-term vWPAs backed by creditworthy corporate off-takers (e.g., tech hyperscalers), isolating cash flows from local rate hikes and FX volatility.

Unbankable Collateral & Buyer Default Public municipal assets cannot be pledged or seized as debt collateral, while single local off-takers carry total cash-flow collapse risk.	Credit-Enhanced SPV Architecture Decouples debt service from physical asset ownership by securing SPVs with corporate off-take credits, DFI guarantees, and multi-buyer cash flow pools.
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5. Conclusion

The global water crisis is fundamentally a capital allocation problem. While trillions of dollars flow through sustainable bond markets, water infrastructure remains underfunded due to contract heterogeneity, manual audit friction, and sub-scale asset sizes.

Kreneon eliminates this friction by:

- 1) Operating as a regulated digital registry and standardized contract platform.
- 2) By pairing hardware-attested at the meter telemetry with regulated Virtual Water Purchase Agreements (vWPAs), Kreneon provides the missing contractual standardization layer.
- 3) As demonstrated in these example use cases,, this infrastructure aggregates distributed projects, lowers the cost of capital, and turns physical water into bankable, institutional-grade Blue Bonds.

Fundamentally - **Kreneon holds the key to bankability of large and small projects, unlocking Blue Bond scaling to address \$1T/year** in needed water infrastructure build out.

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