

Water From Inhibitor to Enabler

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KEY TAKEAWAYS

CONTEXT

WHY WATER MATTERS

Mining is one of the world's most **water-intensive** industries

4-7%

OF GLOBAL FRESHWATER

Mining's share of annual global freshwater withdrawals.

72%

AT RISK

Of the world's largest mines are located in high water-stressed or arid regions.

\$12.8 B

LOST

Total cost of water-related disruptions and production halts (2018–2023).

TOP 3

OPERATIONAL RISK

Ranked by over 50% of mining executives globally.

Source: Veolia Market Intelligence / Consolidated Industry Data (S&P Global, CDP Water & WEF)

WATER RISK IN MINING



The Supply-Demand Gap

40% deficit projected between global water supply and demand by 2030.



Financial Risk

\$50 Billion in annual revenue at risk for the global mining sector due to water scarcity.



Social License (LTO)

Water is now the **#1 driver of community conflict** and project delays in mining.

source : UN World Water Development Report 2024

AND AT A COMMODITY LEVEL

Copper production 1900 to 2024

Based on mined, rather than refined, production. Measured in tonnes.



Data source: USGS - Mineral Commodity Summaries (2023); World Mineral Statistics (2023)

Lithium production 2000 to 2024

Based on mined, rather than refined, production. Measured in tonnes.



Data source: USGS - Mineral Commodity Summaries (2023); USGS - Historical Statistics for Mineral and Material Commodities (2024)
Note: Values are reported as tonnes of lithium content.
OurWorldinData.org/metals-minerals | CC BY

Over half of today's lithium and cobalt production comes from water-stressed areas.

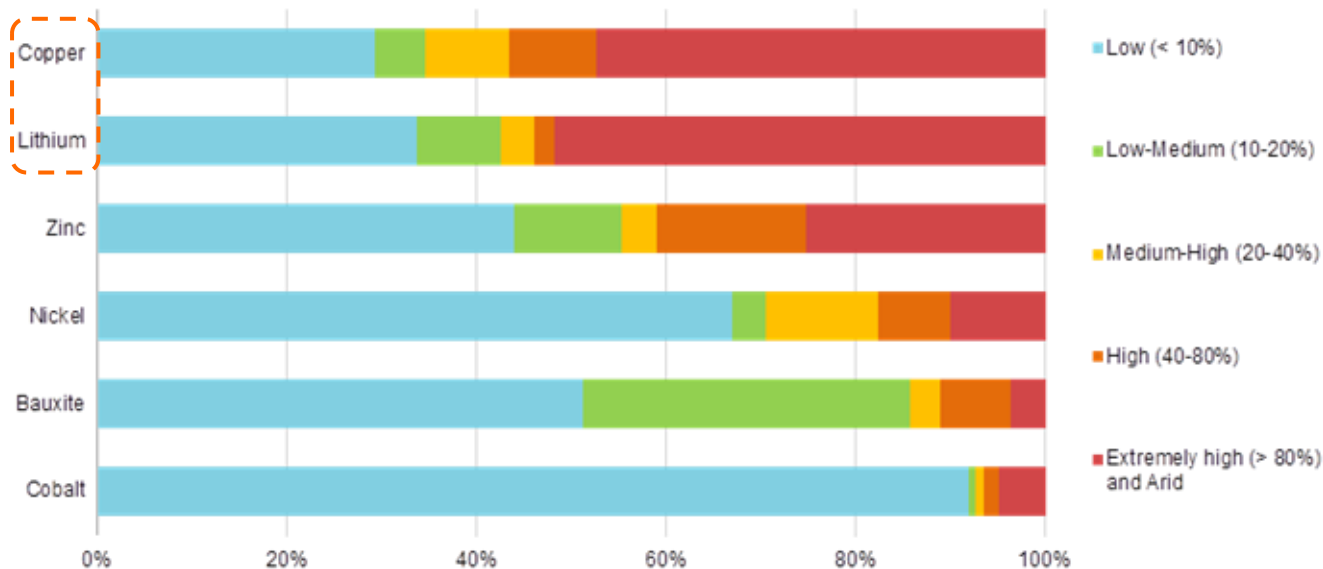
30-50% of global copper, gold, iron ore and zinc production sits in high water-stress regions – roughly \$150 billion of annual revenue at risk.

80% of Chile's copper is mined in extremely water-stressed conditions today. By 2040, that hits 100%.

CRITICAL METALS ARE HIGHLY EXPOSED TO WATER STRESS

Copper and lithium, key metals for the energy transition, are among the commodities most exposed to water stress globally.

Share of production volume by water stress level for selected minerals, 2020



Water stress levels are as defined in the Aqueduct 3.0 dataset according to the ratio of total water withdrawals over the total available surface and groundwater supplies.

ICMM report, July 2026 “**Physical water risks are not peripheral. They represent a structural constraint on the expansion of the mining and metals sector**, and therefore on the pace of the energy transition itself.”

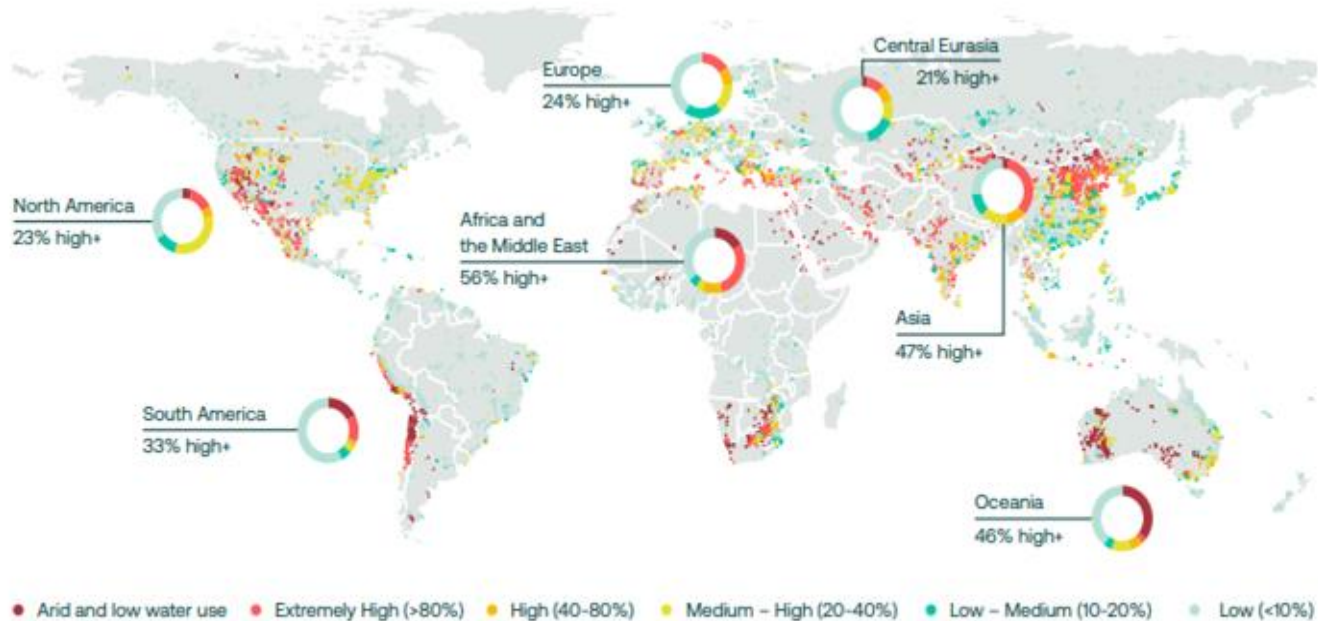


Figure 2: Global Distribution and Regional Exposure Profile of Baseline Water Stress for Mining and Metals Facilities

Dot points show the baseline water stress level at a facility level, pie charts show the distribution of baseline water stress at a regional level

DROUGHT AND FLOODS

Mining operations are increasingly exposed to both sides of water risk.

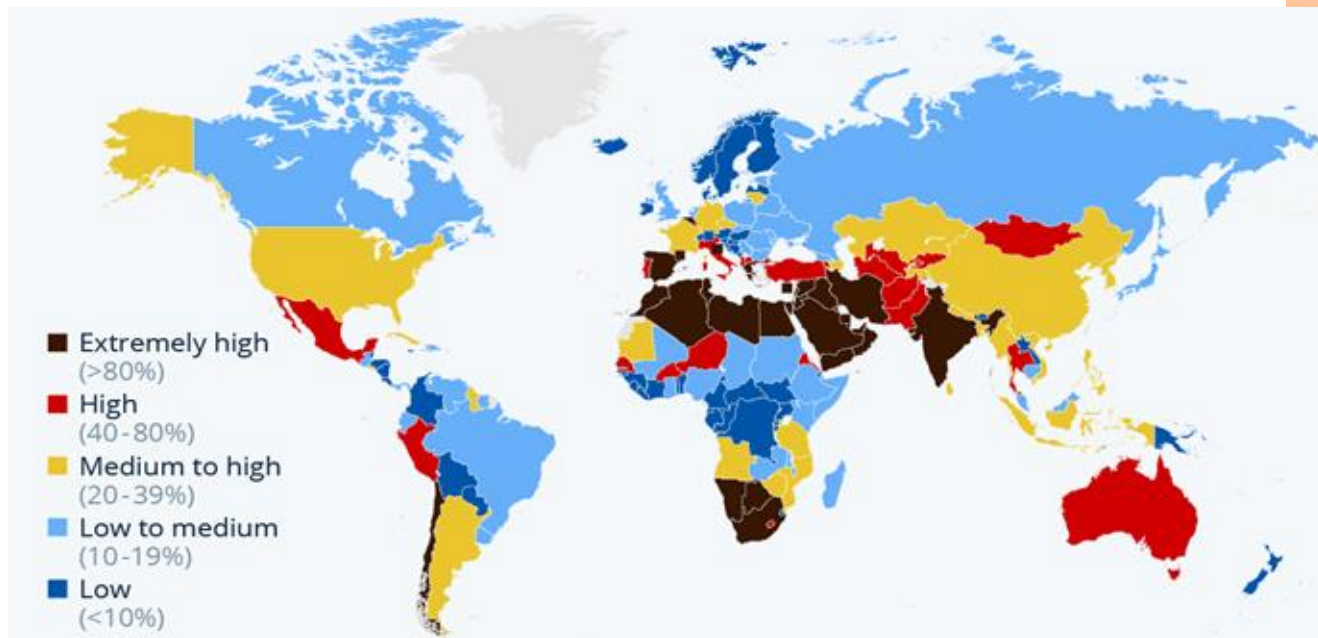


Water risk is not only about scarcity, both too little and too much water can stop production.

WITH GROWING WATER SCARCITY, Risks are real



WHERE WATER STRESS WILL BE HIGHEST BY 2050



Projected ratio of human water demand to water availability (water stress level) in 2050.

source : [STATISTA](#)

**WHERE WERE WE 5 YEARS AGO
AND
HOW FAR HAVE WE COME ?**

THE STATE OF PLAY: 2019 VS 2024

The industry has made measurable progress but **demand is accelerating faster than solutions are being deployed.**

Metric	2019	2024	Change
Industry avg. water recycling rate	44%	64%	▲ +20%
<u>Mines with formal water management plans</u>	38%	75%	▲ +37%
Global investment in mine water tech	\$2.2B	<u>\$5.8B</u>	▲ +163%
Regulatory violations (water-related)	High	Low	▼ -30%
<u>Mines in water-stressed regions</u>	40%	54%	▲ Increasing
<u>Zero Liquid Discharge (ZLD) adoption</u>	<5%	22%	▲ Significant

Source : WRI Aqueduct Water Risk Atlas (2024)
ICMM Water Stewardship Reports (2019-2025)
Bluefield Research: Industrial Water Market Insight

APPROACH

**WHERE ARE YOU AS
YOU JOURNEY TOWARD
WATER SECURITY AND RESILIENCE?**

Where are you on **your journey** toward water security and resilience?

WATER SECURITY ASSESSMENT

Analyse your current situation, identify vulnerabilities, and uncover opportunities to strengthen your water adaptability.



WATER SECURITY STRATEGIC PLAN

A medium to long-term roadmap to reach the performance and adaptability level related to your future ambition and existing challenges.

SOLUTION DESIGN & ENGINEERING

Implement the strategy with Veolia's technical experts and watertechnologies solutions, for brownfield upgrades and greenfield design.

ASSET DELIVERY

Structure projects in link with customer needs and local partners, backed by Veolia's international experience.

WATER SECURITY

You turned your water supply to support your development on long term in link with your performance targets and local environmental challenge.

FINANCIAL VIABILITY

Define together the best business model to support the project structuring, foster territorial synergies, and bridge public funding with private capital.

LONG-TERM PERFORMANCES

Ensure project performances with access to contracts providing reliable water supply at all times, with continuous optimisation.

SOLUTIONS

What are some of the alternative water sources?

As water scarcity increases, alternative sources help secure reliable, sustainable water supply for mining operations.

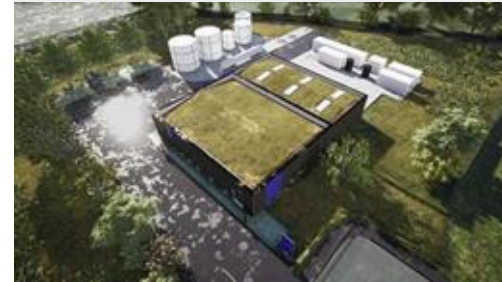
DESALINATION

Seawater or brackish water treated to provide an alternative water supply for mining operations.



WATER REUSE

Treated municipal, industrial or mine water reused for mining applications, reducing reliance on freshwater resources.



Diversifying water sources can reduce reliance on freshwater resources and strengthen water security.

DESALINATION

Developing Sustainable Solutions transforming salted water into fresh water in a cost-effective and energy-efficient way



SOLUTIONS

With advanced membrane technologies, we are able to provide water where it is most needed.

Transitioning toward energy-efficient, modular systems that optimise water treatment processes from intake to brine discharge.



KEY FEATURES

- Plug-and-play system
- Modular Reverse Osmosis system reducing footprint by 25%.
- Digital Monitoring: AI-driven Hubgrade platform for real-time energy and membrane performance optimization.
- Energy Efficiency: Record-low consumption



BENEFITS

- Resilience & Independence: Unlike surface water or dams which are impacted by climate events, desalination is a reliable partner for long-term
- Affordability: Significant cost reductions through process optimization and modular design.
- Long term approach: Minimised environmental impact through reduced chemical use and decarbonized energy. While ensuring continuous water supply.



MA'ADEN PHOSPHATE COMPANY

Mobile seawater desalination, Ras Al Khair, Saudi Arabia



MOBILE SWRO
SEAWATER DESALINATION

9,600 m³/day

PRODUCTION CAPACITY



FULL SCOPE
INSTALLATION + O&M



CHALLENGE

Existing MED system facing performance issues

Need for a rapid temporary solution to replace MED production while taking the unit out of service

Short implementation timeframe and remote location

SOLUTION

Mobile Water Services with full operation

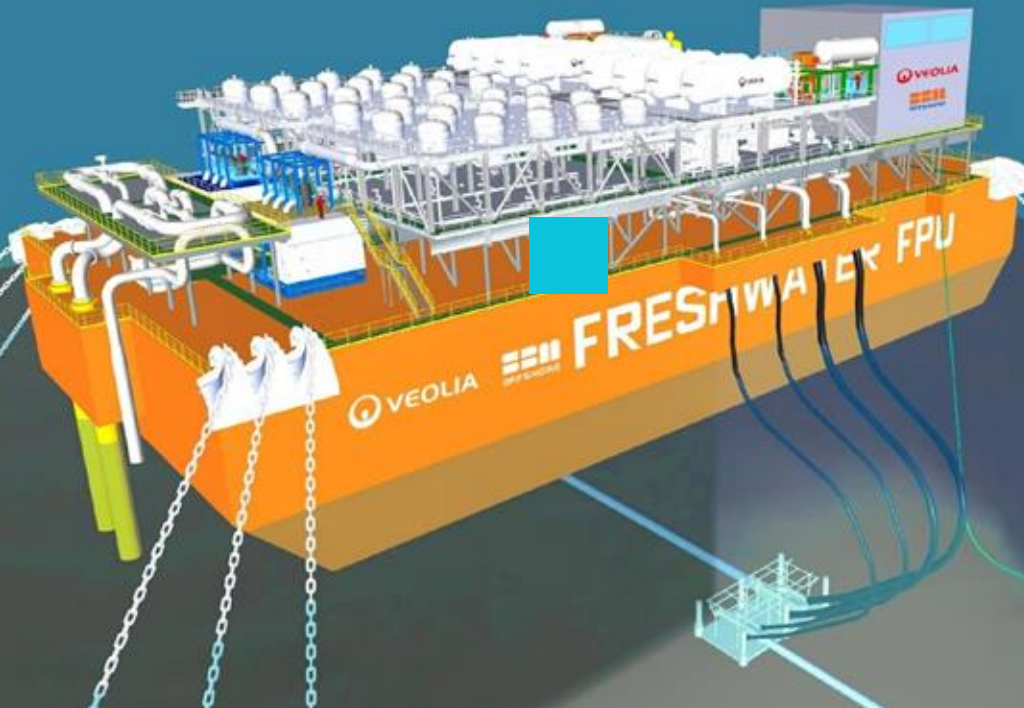
Mobile MMF + SWRO + BWRO treatment

Full scope including installation, diesel generators, fuel supply, labour, HSE, consumables and O&M

BENEFITS

9,600 m³/day of seawater desalination capacity
Rapid deployment to maintain water production
Fully operated solution limiting disruption during MED outage

Innovation - Floating Desal



~ 24 months

Faster & cheaper construction in shipyard



Faster permitting process

Faster Project Development & Lower DEVEX



No upfront CAPEX

Lease & Operate / BOO business model



No land occupation

Limited impact on population and sea life
Floating unit allowing an easy
decommissioning

WHAT IS THE RE-USE PERCENTAGE FOR YOUR MINE?

WATER REUSE

Water reuse solutions allow to **transform wastewater into a reliable, local and sustainable resource** that strengthens water security in stressed regions.



SOLUTIONS

Designs are **tailored** to achieve the **quality required** for your needs.

Veolia delivers **multi-barrier, advanced treatment schemes**, integrating:

- membrane filtration,
- advanced oxidation,
- biofiltration,
- reverse osmosis
- nanofiltration.



KEY FEATURES

- **Modular** treatment blocks are engineered to **fit existing assets** and **adapt to the quality** you need.
- Solutions are designed to meet stringent **regulatory standards**.
- **Advanced monitoring** safeguards performance and compliance.



BENEFITS

- **A constant, non-seasonal water source**, directly where it is needed.
- **Reduced pressure** on natural freshwater sources.
- **Adaptation** to drought, growth and climate stress.
- **Operational certainty and compliance** through continuous monitoring.



Municipal Wastewater Reuse

El Prat de Llobregat - Barcelona, Spain



>70%

Reuse rate

302,400 m³/day

Tertiary treatment capacity



15,000 m³

Aquifer recharge/day

Growing demand + reduced Llobregat River flows required a multi-use solution across 6 sectors and multiple stakeholders.

Water resources

River flow protection

14-well groundwater recharge

Saline intrusion prevention

Agriculture & industry

Irrigation supply

Industrial use

Buffer against restriction losses

Urban & Potable

Urban irrigation

Indirect potable reuse

Lower cost than desalination



Municipal Wastewater Reuse

Arequipa, Peru



PPP

PROJECT MODEL

2015 - 2030

O&M CONTRACT PERIOD



5/10/15Y

CONTRACT OPTION



Mining client in collaboration with local institutions realised a PPP project for the reuse of the city's wastewater, addressing water competition and river pollution.

CHALLENGE

- Competition for water resources
- Polluted river
- Local community concerns

SOLUTION

Veolia O&M: WWTP, pipes & headworks
Collection, headworks, pre-treatment
Clarification, screen & band filters
Air control & odor mitigation

BENEFITS

Chile River ecosystem recovery
Improved community health
Guaranteed continuous service
O&M cost reduction

Municipal Wastewater Reuse

HONOLULU, HAWAII – USA



49,210 m³/day

Secondary effluent treated



45,424 m³/day

Reclaimed water
produced



2 water qualities

High-purity & R1
recycled water

Growing demand + declining groundwater supplies required an alternative water source to support industrial users and irrigation while preserving potable water resources.

Industrial reuse

High-purity recycled water
Microfiltration + reverse osmosis
Water sold to industrial users

Irrigation

R1 recycled water
Flocculation + sand filtration + UV
Distributed through a 15-mile network

Water security

Reduced pressure on potable water
resources
Guaranteed supply of quality recycled
water
Long-term public-private partnership



Mine Water Re-use

Key Objectives

Conserve
Water

Licence to
Operate

Water Management Salt

Main Drivers - control *salinity*

- ❖ Reducing salt addition in the overall process
- ❖ Recovering salts from the water recycling loop
- ❖ Extracting excess salts in the form of **saleable by-products** on the local market

BENEFICIAL REUSE – AUSTRALIAN COAL OPERATION

Mine water reuse for industrial cooling

95%
RO RECOVERY



1,700 m³/h
INTAKE CAPACITY



CHALLENGE

Secure mine-water management while maintaining mining and nearby power generation operations.

SOLUTION

Mine water treated and reused as cooling water for a nearby power station.

BENEFITS



Water security: Reduced demand for local freshwater resources.

Reliability: Continued water supply for industrial production.

Resource recovery: Reduced waste through salt and by-product recovery.

Sustainability: Strengthened environmental licence to operate.



BENEFICIAL REUSE – AUSTRALIAN RARE EARTH OPERATION

Industrial water reuse

400 m³/h

TREATMENT
CAPACITY



90%

RO RECOVERY



CHALLENGE

Increased ore throughput required additional high-quality process water

Scarce bore water resources in an arid region needed to be protected

Existing recycled water capacity had to be expanded

SOLUTION

OPUS technology

Industrial water treatment and reuse

High-recovery reverse osmosis system

BENEFITS

High water recovery supporting industrial operations

Reduced freshwater requirements

Improved water efficiency and operational resilience



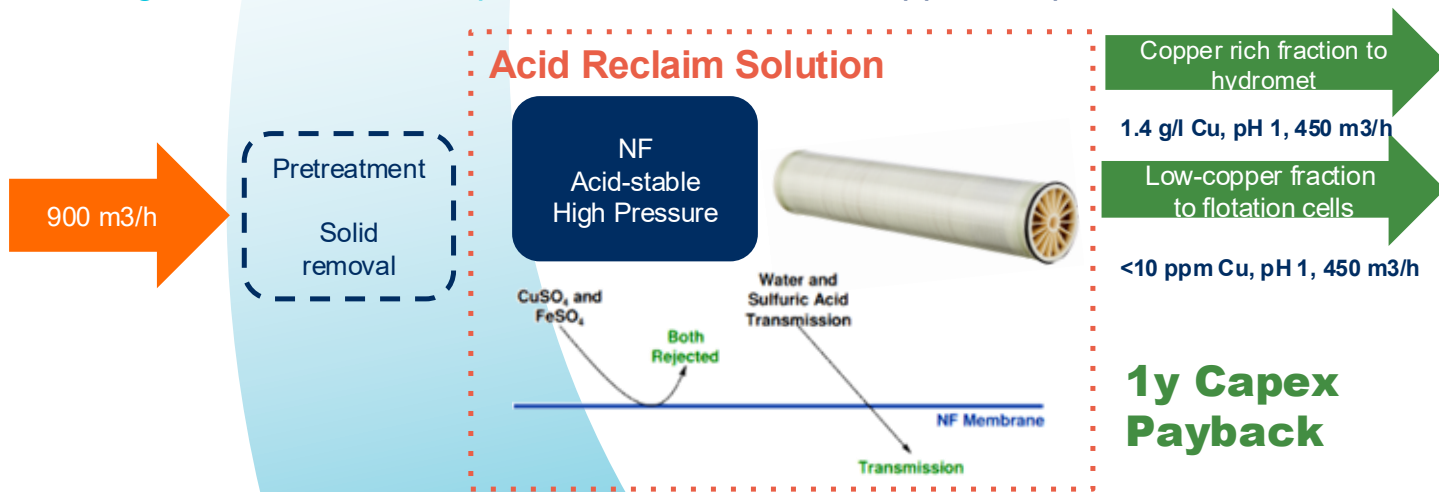
Sulfuric Acid - Copper Leaching

Copper mine in Mexico

Pregnant leach solution pond

⇒ 4% acid leaching

⇒ 6000 m³, 800 ppm Cu, pH 2-3



ECONOMIC

Extra copper recovery
Reduced water usage in
remote & dry areas



DE-RISKING

Easing local environmental permits
Eliminate risk of pond overflow



SOCIAL RESPONSIBILITY

Sustainable solution
Positive CO₂ impact
Minimizing environmental impact



Sulfuric Acid - Titanium Dioxide

28 kta TiO₂ producer in China
1t TiO₂

⇒ 4-5t waste acid (23-26% acid, 25-45 g/l Fe)
⇒ **35-50t acidic WW** (3-6% acid, 4-7 g/l Fe)



ECONOMIC

Reduction of acid & lime purchases
Less effluent treatment cost
(less volume, less salt content)



DE-RISKING

Easing local environmental permits
Reduced dependence on gypsum offtake
More resilient towards chemicals supply variability (availability + price)



SOCIAL RESPONSIBILITY

Sustainable solution
Positive CO₂ impact
Minimizing environmental impact



LONG TERM OPERATIONAL PERFORMANCE

Ensuring reliable water supply at all times, with continuous optimisation.



Solutions

Operate facilities under long-term contracts that ensure reliability, compliance, and cost-efficiency.

Anticipate issues before they become crises and optimise performance over the assets' lifetime.



Features

- Global best practices applied locally, (experience in **operating complex assets**)
- **Performance guarantees** supported by robust process control.
- **Digital predictive monitoring** to detect anomalies and prevent service disruption.
- **Continuous improvement** programs.



Benefits

- **Consistent water quantity and quality** through performance-based operations.
- Improved operational efficiency and **lower operating costs**.
- **Reduced environmental risks**.

OPERATIONAL EXCELLENCE

Mining companies are already using AI to improve performance, reliability and resource efficiency.

What mining companies have done with AI tools

BHP – Escondida

AI-powered plant control

3bn L water + 118 GWh saved

since FY22 at Escondida copper mine

AI applied to operational systems
Plant control used to reduce water and energy use
AI hub launched to scale adoption across operations

Anglo American

Predictive intelligence + digital twins

Failures detected before they occur

AI used across predictive maintenance and processing

Predictive maintenance models reduce unplanned downtime
Machine-learning digital twins define best operating recipes
Digital control supports recovery, energy and water efficiency

Vale

Computer vision for asset reliability

Belt tears detected in 3 seconds

with automatic equipment shutdown

AI / computer vision monitors conveyor belts
Automated shutdown prevents further damage
Reduces corrective maintenance and risky manual inspections

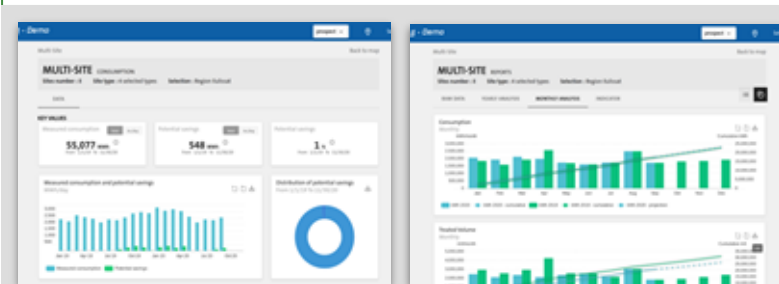
Sources: BHP (2025); Anglo American Annual Report 2024; Vale Innovation

OPERATIONAL EXCELLENCE

Ensuring reliable water supply at all times,
with continuous optimisation.



eTRACKING



eTracking - Monitoring energy efficiency of the assets -
Prediction of expected consumption with AI and alerts in
case of drift - Allow deepdive analysis before sending
troubleshooting teams

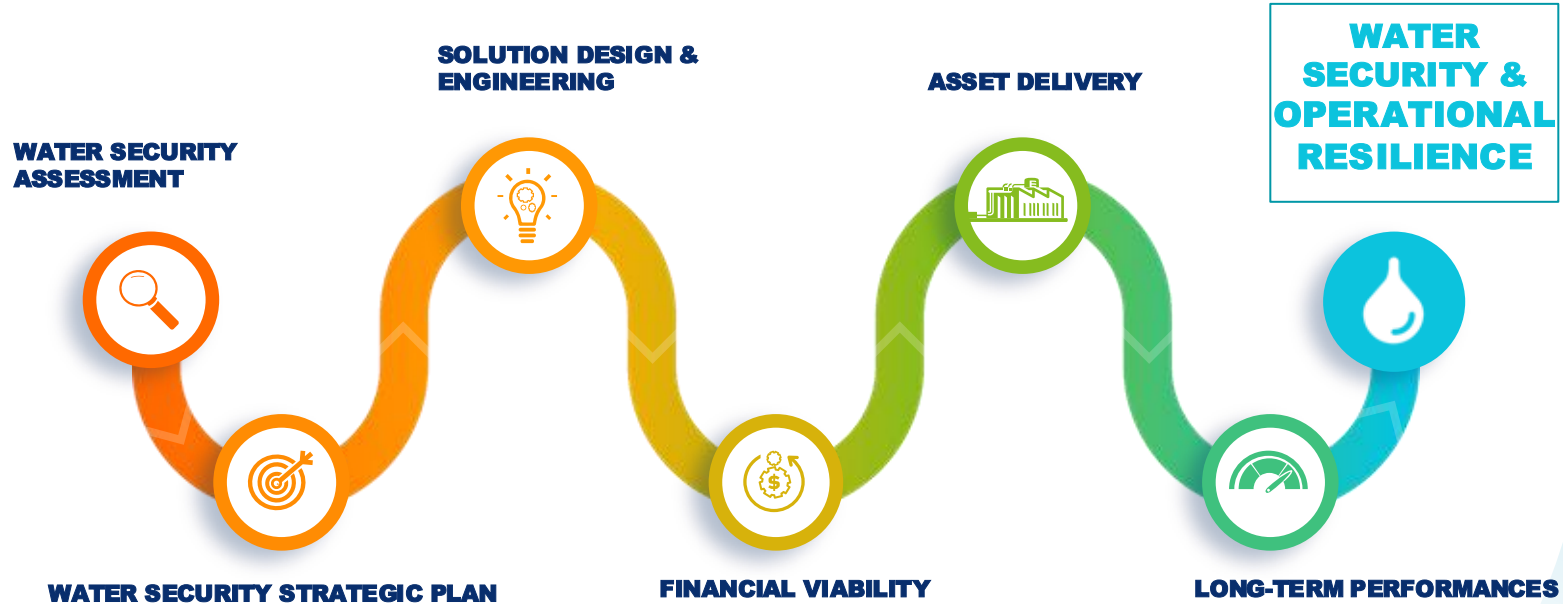
AI DIGITAL TWIN CREATOR



Image recognition and vectorization to create the
interface of the Digital twin.

**What if you could shift water
from vulnerability to strategic
strength?**

Define your solution today to meet your current and future needs



THANK YOU.



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ANNEXES