Leather Naturally

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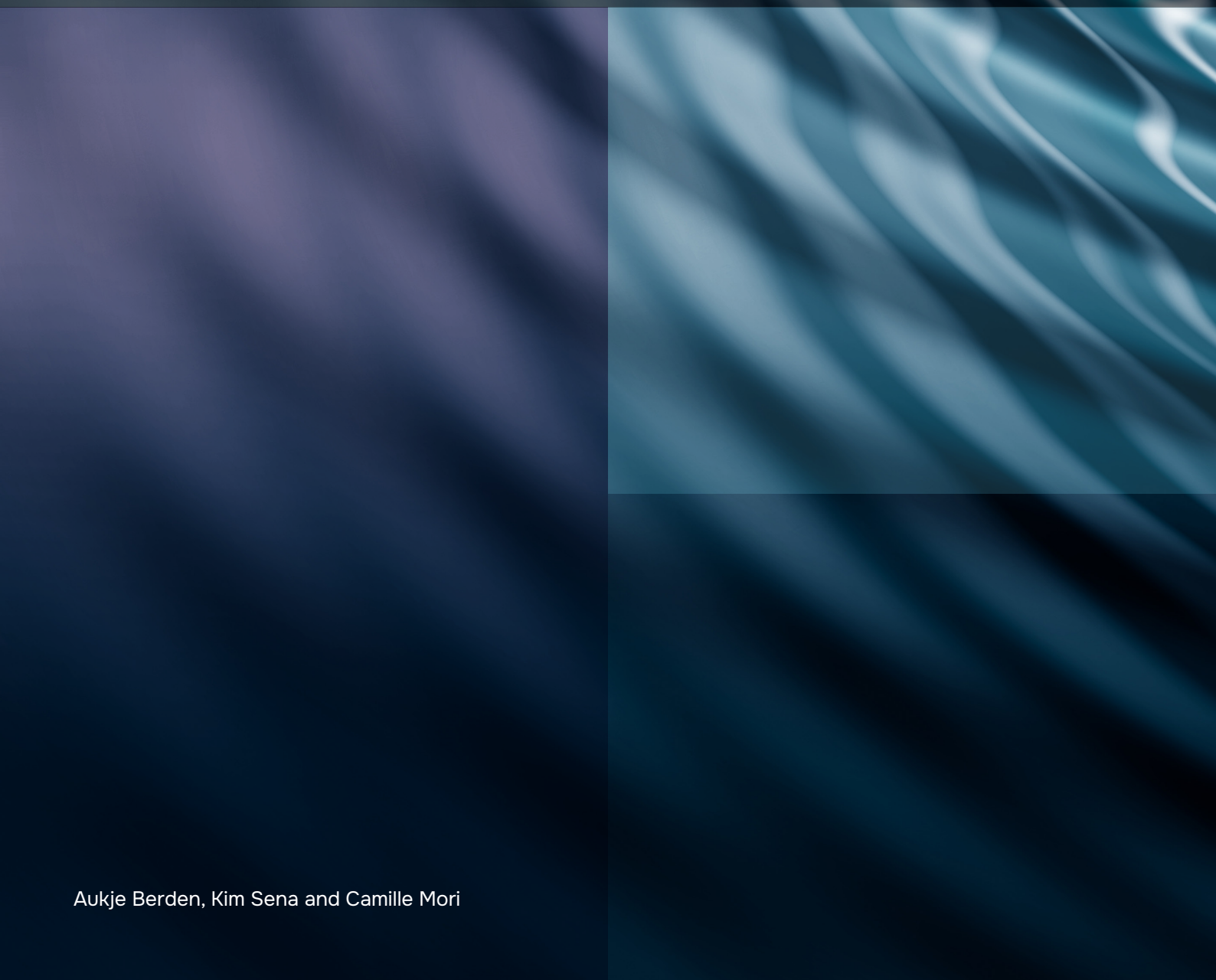
Sustainable water management in the leather industry



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The objective of this guide

Welcome to this detailed guide on sustainable water management in the leather industry.

This publication aims to highlight water's essential role in leather making and its link to environmental sustainability and climate resilience. It also seeks to clarify the topic and equip stakeholders throughout the leather value chain with the knowledge and tools to understand, interpret, and work together on sustainable water management.

By clarifying key concepts and showcasing best practices at various stages of the leather making process, we aim to promote a shared approach to sustainable water management. With a specific focus on bovine leather and tannery operations, this guide also draws on insights from a Life Cycle Assessment study conducted by Leather Naturally together with Spin360.

The result is a fact-based, practical resource to support more informed decision-making. Together, we can foster a more sustainable future for leather.

This publication is intended for industry professionals, sustainability leaders, suppliers, brands, and policymakers aiming to deepen their understanding of water's role in tannery operations for leather production and how it can be managed more sustainably for long-term impact.

> This is not just an environmental duty but also a strategic chance to develop a more resilient, responsible, and future-ready leather sector

Introduction

Why water remains a strategic priority for the leather industry

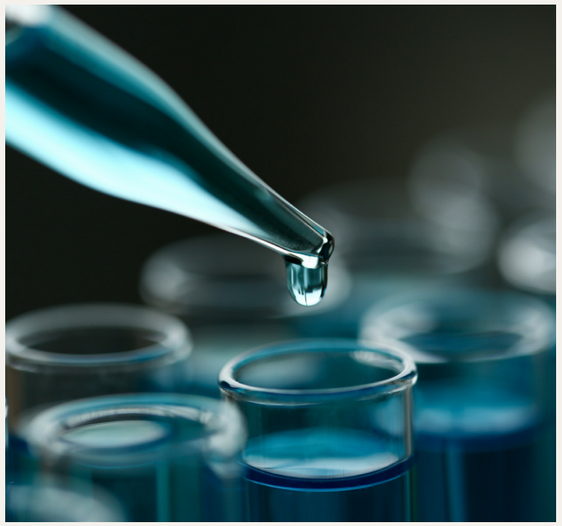
Water is the lifeblood of leather making; it imparts softness to hides, carries the formulations that transform raw material into lasting quality, and shapes the character of every finished leather product. More than just an input resource, water is a strategic priority for the leather industry.

The leather-making process relies heavily on water, but it faces mounting challenges due to water scarcity, quality concerns, and climate change. As global temperatures increase and droughts become more frequent and severe, the availability of freshwater is strained, especially in regions where leather processing and raw material sourcing take place. This situation could threaten both operations and communities.

By adopting sustainable water management practices, the leather industry can reduce its environmental impact, enhance long-term resilience, and support global water security, transforming a critical risk into a shared opportunity for positive change.

Sustainable water management in leather involves using water efficiently, reducing pollution, and safeguarding local water sources for future generations. It includes:

- **Managing water usage through enhanced processes and technology.**
- **Lowering fresh water use through recycling and reusing water during production processes.**
- **Properly treating wastewater to comply with environmental standards for wastewater discharge.**
- **Assessing and managing water-related risks as part of climate resilience.**



The basis of sustainable water management

Metrics, reporting framework, LCA data

You can only manage what you measure. Sustainable water management in tannery operations starts with a clear understanding of key metrics, transparent reporting, and consistent comparative analysis.

This section highlights the essential metrics, reporting frameworks, and data-driven insights that form the basis of sustainable water management practices across the leather sector.

Water Use vs. Water Consumption

Understanding the difference between water use and water consumption is fundamental to creating relevant metrics and management systems.

- **Water use** refers to the total volume of water withdrawn from a source for processes such as soaking, tanning, and finishing. This includes water that may be treated and returned to the environment.
- **Water consumption**, on the other hand, refers to the portion of water that is not returned, lost through evaporation or incorporation into products.

The basis of sustainable water management

Water management Key Performance Indicators (KPIs):

Several KPIs help tanneries compare their performance, spot inefficiencies, and track progress over time. These indicators are vital for managing water use more efficiently and sustainably.

KPI's	Definition	Purpose	Formula
Water Withdrawal Intensity Litres per m² of leather	Total volume of water withdrawn from all sources (municipal, surface, groundwater, etc.) divided by the total m² of leather produced.	Measures efficiency of water use relative to production output.	Water Withdrawal Intensity = Total Water Withdrawn (litres) / Leather Produced (m²)
Water Consumption Rate %	Percentage of withdrawn water that is not returned to the same source due to evaporation, incorporation into products, or other losses.	Captures the net water use impact on (local) water resources.	Water Consumed (L) / Water Withdrawn (L) × 100%
Water Reuse Ratio %	Percentage of total water input derived from recycled or reused water instead of new withdrawal.	Indicates circularity and efficiency of internal water systems and a measurement for tracking fresh water use.	Reused or Recycled Water (L) / Total Water Input (L) × 100%
Effluent Quality Metrics E.g. COD, BOD, TSS mg/L	Measures of water quality in discharged treated effluent. **COD (Chemical Oxygen Demand)** The amount of oxygen needed to oxidise both organic and inorganic matter. **BOD (Biochemical Oxygen Demand)** The amount of oxygen microorganisms need to decompose organic matter. **TSS (Total Suspended Solids)** The concentration of suspended solids in effluent.	Indicates the effectiveness of wastewater treatment and compliance with discharge standards.	
Leak Detection and Response Time Hours (h) or days (d)	The average time from detecting a leak in the water system to completing repairs.	Demonstrates operational responsiveness and the efficiency of water loss prevention.	Sum of (Detection to Repair Times) divided by the Number of Leaks Detected
Water Intensity per Unit Output L/m³ of leather	A broader indicator of total water used per unit of production output (e.g., kg of product, m² of leather, or revenue).	Tracks overall water efficiency and progress over time.	Total Water Use (L) / Total Output (Unit)

Reporting Standards and Transparency

Several industry bodies have established audit standards for leather manufacturing that assess water usage, effluent treatment, and chemical management across facilities. Leading certification and audit frameworks in this space align with broader international standards, including:

- **ISO 14046 (Water Footprint)**
- **GRI 303 (Water and Effluents)**
- **UN SDG 6 (Clean Water and Sanitation)**
- **ZDHC Wastewater Guidelines (Effluent)**

LCA Data

Solutions also need to be data-driven and equitable. Consumers may expect more than glossy claims: measurable, transparent impact. Leather Naturally published a Life Cycle Assessment study in 2024, supported technically by Spin360, providing a comprehensive view of environmental impacts across the product's life – from cattle farming to end-of-life disposal, and including water-related impacts. Key findings include:

- Upstream processes (e.g., farming) contribute significantly to water consumption.
- Closed-loop water systems in modern tanneries can substantially decrease overall water use and enhance effluent quality.
- Post-tanning processes significantly add to freshwater ecotoxicity due to chemical usage.

Water intensity (litres used per kg of end product) in leather production, especially when upstream processes such as cattle farming are included, may seem high at first. However, when considering the wider context of raw materials used in footwear, automotive, and upholstery sectors, it becomes clear that sustainability performance cannot be measured by a single metric. Materials like synthetic polymers, natural fibres, and bio-based alternatives each present their own environmental trade-offs, from microplastic pollution and reliance on fossil fuels to land use and chemical runoff.

Life Cycle Assessments (LCAs) are valuable tools for understanding these trade-offs, but only when applied wisely and interpreted in full context. Focusing on a single category (such as carbon footprint alone) risks distorting priorities. Genuine progress involves evaluating multiple environmental factors alongside traditional procurement criteria like price and quality, to support strategic, data-driven, and balanced decision-making.

Findings from the Leather Naturally LCA study highlight that, while water use is an important impact category, it must be considered alongside other factors such as durability, recyclability, energy consumption, and end-of-life outcomes. In this context, leather's long lifespan and repairability can offset some of its initial environmental costs. Ultimately, the sustainability performance of any material is a multidimensional challenge, one that requires a holistic, lifecycle-based approach rather than isolated comparisons.

For more information on the LCA – check out this Leather Naturally White Paper: **www.leathernaturally.org/lca-study/**

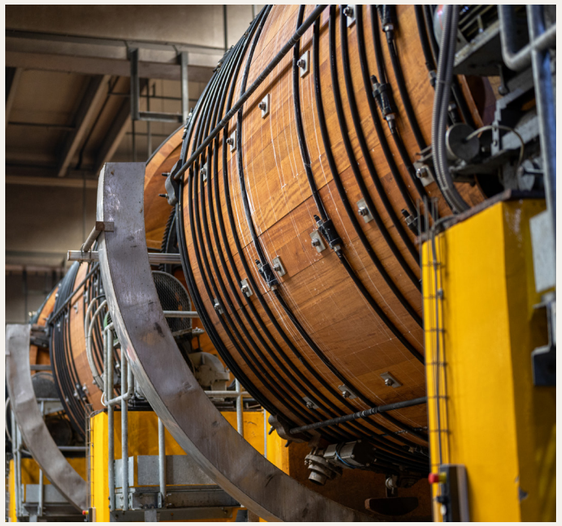
How sustainable water management is implemented

In practice, sustainable water management relies on a holistic, integrated approach that combines various measures across tannery operations.

These can include simple actions such as installing water meters to monitor usage and improve efficiency, along with more advanced practices like establishing KPIs for consistent reporting and continuous improvement, optimising and automating processes, adopting water-saving technologies, upgrading wastewater treatment systems, and transitioning to less water-intensive tanning methods. Essentially, all these measures should address the increasing challenges of water scarcity, water quality (both input and output), and climate change.

The following five case studies showcase best practices in holistic, sustainable water management and highlight measurable improvements in key water performance indicators.

- **Technology/materials:** Managing water usage through improved processes (mechanical) and water-saving technology.
- **Reduction of water consumption:** Lowering fresh water use through recycling and reusing water within production cycles, in accordance with circular economy principles.
- **Quality management:** Properly treating wastewater to meet environmental standards through membrane filtration, bio-treatment, wastewater facilities, pollution prevention, and treatment approaches.
- **Risk management:** Assessing and addressing water-related risks as part of climate resilience.



Case studies

Water efficiency is no longer a future ambition for the leather industry, it is happening now. These case studies highlight a range of approaches, from recipe redesign and equipment upgrades to large-scale wastewater treatment investment, demonstrating measurable progress across different regions and business models.

JBS — Brazil

JBS Couros Cascavel is a facility that produces leather for the footwear sector, particularly crust for the athletic shoe industry. At the beginning of 2024, a project was undertaken to redesign retanning recipes for better water efficiency, resulting in a 46% reduction in water use per recipe. In parallel, it was identified that the furnace was responsible for significant water consumption.

After careful analysis, the furnace was replaced with an electrical steam system. This update and investment in new technology allowed for an overall reduction in water use in the tannery. By June 2024, following the completion of improvements to water efficiency in retanning recipes and the transition to an electric steam system, the facility achieved an overall water reduction of 37% (l/m2).

Prime Asia — China and Vietnam

Under its Consciously Crafted sustainability strategy, PrimeAsia set a water efficiency target to reduce freshwater use by 30% from 2019 to 2023.

Their key actions included:

1. Identifying machinery upgrades to reduce water use,
2. Researching recipe modifications and new chemicals for water efficiency, *and*
3. Implementing robust monitoring systems within their tanneries to pinpoint areas for freshwater reduction.

Ultimately, the company exceeded its target, reducing its freshwater use by 43% by 2023 in their facilities in China and Vietnam. Looking ahead, they plan to use 100% recycled water in production by 2040.

ISA Tantec — Vietnam

Wetting back wet blue is a common process in tanneries to evenly restore moisture and prepare the leather for further processing, but it inherently adds water to the process without changing the product. ISA Tantec has developed a method to separate used water from the process and filter it for reuse. Along with using untreated water to dilute chemicals at the wastewater plant, these measures have resulted in a 20% reduction in overall water consumption at the facility.

These features have been successfully implemented in ISA Tantec's two tanneries in Vietnam.

Igualadina de Depuració i Recuperació — Spain

The Igualadina de Depuració i Recuperació (IDR) plant is a European pioneer in biological wastewater treatment. Equipped with state-of-the-art technology, it ensures maximum efficiency and quality in processing wastewater from the leather industry in Igualada. Besides serving the leather sector, the plant also manages non-hazardous liquid waste for other industries, helping to reduce environmental impact across Catalonia's industrial landscape.

Work is currently ongoing at the Water Regeneration Station. The first step was assembling a pilot membrane plant. Then, a 60 m^3/day ultrafiltration system was installed. So far, 1.5 million euros have been spent on a new water purification facility to prepare for a membrane system for all their processed water (4,000 m^3/day). The installation of the membrane system and piping back to the tanneries is expected to be completed by 2027.

COTANCE

As the representative body of European Tanneries, COTANCE coordinates member associations around regulatory, reputation, and market-oriented priorities, including water management. COTANCE has played a vital role in developing the Product Environmental Footprint (PEF) for leather, providing technical expertise and coordinating stakeholders across the entire value chain.

This work has been crucial in establishing a harmonised and credible framework for measuring and communicating leather's environmental performance.

Limitations and challenges in water management

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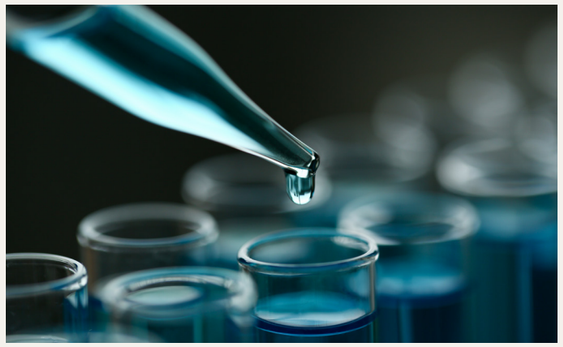


High Water Consumption and Scarcity Risks

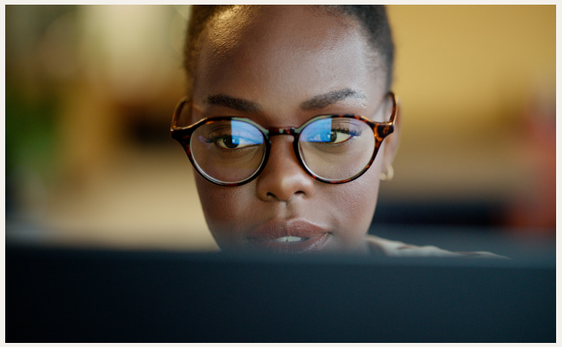
Leather production is inherently water-intensive, involving considerable use during multiple processing stages. In areas already experiencing water scarcity, withdrawal quantities can create operational and reputational risks. Achieving a balance between production demands and responsible resource management calls for process innovation, investment in water-efficient technologies, and robust local water stewardship collaborations.

Strategic Response: Prioritise reducing water withdrawal intensity and increasing reuse and recycling ratios through process optimisation, investment in circular systems, and implementation of site-level water-efficiency plans. The WWF Water Risk Filter (WRF) is a valuable strategic screening and prioritisation tool for identifying and understanding water-related risks across operations and supply chains. The WWF Water Risk Filter is part of the WWF's Risk Filter Suite and offers a comprehensive, free tool to assist with corporate- and portfolio-level screening of water risks, supporting the prioritisation of actions.

Pollution and Contamination Risks

Effluent from tanning operations may contain a complex mixture of organic substances, chemicals, metals, and dyes that can harm local ecosystems if not adequately treated. Maintaining high standards for effluent quality (COD, BOD, TSS) is vital but can be technically challenging to achieve the required volume and quality of leather.

Strategic Response: Continue strengthening effluent treatment infrastructure, enhancing monitoring and reporting, and utilise the measurements to adopt more sustainable innovative solutions, aligning with international standards and the Zero Discharge of Hazardous Chemicals (ZDHC) certification protocols.



Regulatory Pressures and Compliance Complexity

Water-related regulations are becoming more stringent and regionally diverse, creating operational and administrative challenges for compliance across sites and supply chains.

Strategic Response: Adopt a proactive stance on compliance by combining global standards with local requirements into a single internal framework, supported by regular audits, engaging suppliers, and transparent reporting.

Financial and Technical Barriers

Advanced water treatment, closed-loop systems, and monitoring technologies demand significant initial investment and specialised expertise. Smaller facilities and suppliers might lack the resources to implement best practices as quickly.

Strategic Response: Foster shared learning and technical partnerships, utilise green financing opportunities, and assist suppliers through targeted capacity-building programmes and technology transfer initiatives.

Implementation and Data Challenges

Even when targets are clear, consistent implementation can be hampered by variable infrastructure, data quality, and local capacity. Effective data collection and performance monitoring are essential to support decision-making and confirm progress.

Strategic Response: Enhance data governance frameworks, standardise water-related KPIs, and integrate digital monitoring tools to boost transparency and performance management.

Capacity Building and Cultural Integration

Long-term water stewardship relies on people, raising awareness, fostering accountability, and developing skills at every level of the organisation and across the value chain.

Strategic Response: Invest in training programmes, internal campaigns, and ESG leadership initiatives that foster a culture of responsible water use and empower teams to identify and implement improvement opportunities.

Conclusion

Shared responsibility and a call to action

Sustainable water management is not a challenge that any single actor can resolve in isolation. Achieving meaningful, lasting progress requires a holistic, integrated approach that combines technical innovation, data-driven decision-making, robust governance, and active collaboration across the entire leather value chain.

The measures and insights presented throughout this guide, from implementing KPIs and adopting water-efficient technologies to learning from real-world case studies, show that progress is both possible and already ongoing. However, the scale and urgency of the challenge demand more: concerted, coordinated action from all stakeholders.

Tanneries, chemical suppliers, and brands can each operate independently, but a coordinated and collaborative approach achieves much greater impact and accelerates solutions. Chemical suppliers can develop low-water formulations or design products that are easier to treat in wastewater systems. Tanneries can optimise recipes, invest in water-efficient processes, and implement water recycling systems. Brands, in turn, can prioritise lower-impact leather in their sourcing decisions, set clear sustainability requirements for their suppliers, and actively engage with their supply chains to drive positive change.

Governments and regulatory bodies play a critical role by providing clarity and establishing the regulatory framework that fosters system-wide improvements. By building capacity, connecting parties for joint collaboration, unlocking infrastructure investments, and enabling technological advancements, governments can drive the ambitious change required for the industry's sustainability journey.

Communities and environmental NGOs are arguably the most important stakeholders in this discussion. Ensuring a safe and adequate water supply is essential for their livelihoods, health, and overall wellbeing. Open communication channels between communities and both the private and public sectors are fundamental, ensuring that decisions are relevant, inclusive, and responsive to real needs. NGOs serve an important role in facilitating this dialogue, building local capacity, and supporting the implementation of projects with both local and global impact.

The way forward is clear. Sustainable water management involves both technical and cultural factors, and by combining accurate measurement with cross-disciplinary teamwork, innovation, and capacity building, the leather industry can continue to reduce its water footprint, strengthen operational resilience, and support sustainable resource use throughout the value chain. By promoting transparency, investing in innovation, encouraging collaboration, and placing communities at the centre of water stewardship, the industry can change its relationship with this essential resource. This is not just an environmental duty but also a strategic chance to develop a more resilient, responsible, and future-ready leather sector. The time to act is now, and the responsibility lies with all of us.

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