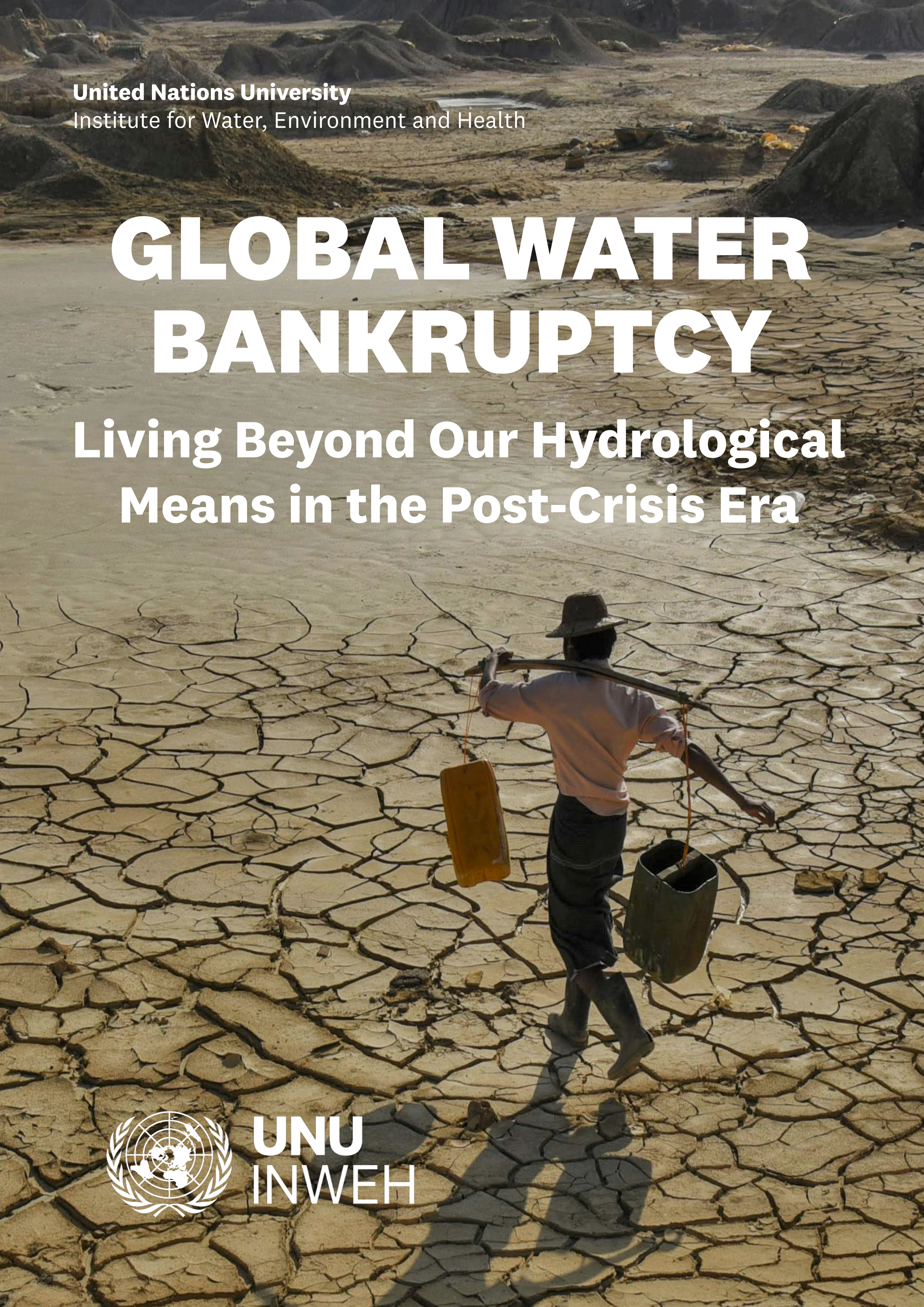

United Nations University
Institute for Water, Environment and Health

GLOBAL WATER BANKRUPTCY

Living Beyond Our Hydrological Means in the Post-Crisis Era

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The United Nations University Institute for Water, Environment and Health (UNU-INWEH) is one of 13 institutions comprising the United Nations University (UNU), the academic arm of the United Nations. Established in 1996 through an agreement with the Government of Canada, UNU-INWEH is headquartered in the City of Richmond Hill, Ontario.

UNU-INWEH specializes in addressing critical global security and development challenges at the intersection of water, environment, and health. Through research, capacity development, policy engagement, and knowledge dissemination, the institute bridges the gap between scientific evidence and the practical needs of policymakers and UN member states, with particular attention to low- and middle-income countries. By collaborating with a diverse array of partners—including UN agencies, governments, academia, the private sector, and civil society—UNU-INWEH develops solutions that advance human security, resilience, and sustainability worldwide.

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Global Water Bankruptcy

Living Beyond Our Hydrological Means in the Post-Crisis Era

United Nations University Institute for Water, Environment, and Health (UNU-INWEH)
Richmond Hill, Ontario, Canada, 2026

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Front cover image: Man carrying water on cracked dry land in Sagaing, Myanmar. Photo by Pyae Phyo Aung.

GLOBAL WATER BANKRUPTCY

Living Beyond Our Hydrological Means in the Post-Crisis Era

United Nations University Institute
for Water, Environment, and Health
Richmond Hill, Canada, 2026

FOREWORD

Water is fundamental to sustainable development, human well-being, and planetary health. When water systems fail, the effects are swift and far-reaching: harvests decline, energy systems are disrupted, public health is endangered, cities become increasingly unlivable, livelihoods are lost, communities are displaced, tensions escalate, and the foundations of peace and stability are undermined. In the context of climate change, biodiversity loss, land degradation, and growing inequalities, water insecurity has emerged as a systemic risk that increasingly constrains progress across the entire 2030 Agenda for Sustainable Development.

As the United Nations system marks three decades of the United Nations University Institute for Water, Environment and Health (UNU-INWEH), a longstanding advocate and global leader in water research, policy, and capacity-building since its establishment in Canada in 1996, this flagship report sheds light on one of the defining challenges of our time. Across regions and levels of development, water systems are under unprecedented pressure. Rivers, lakes and wetlands are degrading, groundwater resources are being depleted beyond sustainable limits, and glaciers are retreating at accelerating rates. These trends signal not only growing stress, but in many contexts a structural imbalance between water demand and available resources. This report refers to this condition as “Water Bankruptcy” and calls for effective action to protect water-related natural capital before damages become fully irreversible.

The concept of water bankruptcy draws attention to the evidence that societies rely on both renewable water flows and long-term natural storage, comparable to drawing on income and savings, and that in many basins and aquifers sustained withdrawals have exceeded renewable replenishment and safe depletion thresholds. As a result, available water resources and associated ecosystem functions have been significantly reduced, with some impacts irreversible or effectively irreversible on human time scales.

Recognizing the era of water bankruptcy, as articulated in this report, can support more effective implementation of internationally agreed goals. It enables a shift from fragmented and reactive responses toward integrated, forward-looking approaches grounded in current and projected hydrological realities. It supports strategies to prevent further irreversible damage, rebalance water use within degraded limits, and promote just and inclusive transitions for affected communities, consistent with the commitment to leave no one behind.

Water is explicitly addressed in Sustainable Development Goal 6, which commits the international community to ensure the availability and sustainable management of water and sanitation for all. At the same time, progress across almost every other Sustainable Development Goal depends directly or indirectly on the stability and integrity of water systems. Despite this centrality, water governance and water-related decision-making remain fragmented across sectors, scales, and institutions. As a result, water-related risks increasingly constrain collective efforts to deliver on the 2030 Agenda. The report encourages positioning water as a catalyst for unlocking co-benefits across the Rio Conventions and the Sustainable Development Goals, a valuable opportunity that cannot be overlooked. Strengthened policy coherence and integrated action are therefore required across the United Nations system and multilateral processes, including those related to climate change, biodiversity, land degradation, disaster risk reduction, and peace and security, to unlock water’s true potential to connect communities and facilitate cooperation when unity is needed the most.

The timing of this report is critical. The period leading to the 2026 and 2028 UN Water Conferences, together with the conclusion of the International Decade for Action “Water for Sustainable Development” in 2028, represents a pivotal opportunity to accelerate implementation, strengthen accountability, and elevate water as a global priority. These milestones provide a platform to align commitments, partnerships, and investments with hydrological realities and long-term resilience, and to plan and implement policies that reflect the water resources available under current and future conditions.

With coordinated leadership, integrated approaches, and sustained investment, water can serve as a catalyst for cooperation, resilience, and shared prosperity. The decisions taken in the coming years will shape development outcomes across People, Planet, Prosperity, Peace, and Partnerships for decades to come.

Tshilidzi Marwala
Rector of the United Nations University
Under-Secretary-General of the United Nations

Terry Duguid
Member of Parliament
Chair of Standing Committee of Natural Resources
House of Commons of Canada

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GLOBAL WATER BANKRUPTCY IN BRIEF

The planet has entered the Global Water Bankruptcy era. In many basins and aquifers, long-term water use has exceeded renewable inflows and safe depletion limits, and parts of the water and natural capital—rivers, lakes, aquifers, wetlands, soils, and glaciers—have been damaged beyond realistic prospects of full recovery.

Billions remain water insecure. Nearly three-quarters of the world's population lives in countries classified as water-insecure or critically water-insecure. Around 2.2 billion people still lack safely managed drinking water, 3.5 billion lack safely managed sanitation, and about 4 billion experience severe water scarcity for at least one month a year.

Surface waters are shrinking at scale. A growing number of major rivers now fail to reach the sea or fall below environmental flow needs for significant parts of the year. More than half of the world's large lakes have lost water since the early 1990s, affecting around one-quarter of the global population that depends directly on them for water security.

Wetlands have been liquidated on a continental scale. Over the past five decades, the world has lost roughly 410 million hectares of natural wetlands—almost the land area of the European Union—including an estimated 177 million hectares of inland marshes and swamps, roughly the size of Libya or seven times the area of the United Kingdom. The loss of ecosystem services from these wetlands is valued at over US$5.1 trillion, roughly equivalent to the combined annual GDP of about 135 of the world's poorest countries.

Groundwater depletion and land subsidence are widespread and often irreversible. Groundwater now provides about 50% of global domestic water use and over 40% of irrigation water, tying both drinking water security and food production directly to rapidly depleting aquifers. Around 70% of the world's major aquifers show long-term declining trends. Excessive groundwater extraction has already contributed to significant land subsidence over more than 6 million square kilometers—almost 5% of the global land area—including over 200,000 square kilometers of urban and densely populated zones where close to 2 billion people live. In some locations, land is sinking by up to 25 centimeters per year, permanently reducing storage capacity and increasing flood risk.

Cryosphere loss is liquidating critical "water savings". The world, in multiple locations, has already lost more than 30% of its glacier mass since 1970. Several low- and mid-latitude mountain ranges risk losing functional glaciers within decades, undermining the long-term security of hundreds of millions of people who rely on glacier- and snowmelt-fed rivers for drinking water, irrigation, and hydropower.

Agricultural heartlands are running down their water capital. Roughly 70% of global freshwater withdrawals are used for agriculture. Around 3 billion people and more than half of the world's food production are located in areas where total water storage—including surface water, soil moisture, snow, ice, and groundwater—is already declining or unstable. More than 170 million hectares of irrigated cropland—roughly the combined land area of France, Spain, Germany and Italy—are under high or very high water stress.

Land and soil degradation are amplifying water-related risks. More than half of global agricultural land is now moderately or severely degraded, reducing soil moisture retention and pushing drylands toward desertification. Salinization alone has degraded roughly 82 million hectares of rainfed cropland and 24 million hectares of irrigated cropland—together more than 100 million hectares of cropland—eroding yields in some of the world's key breadbaskets.

Drought is increasingly anthropogenic and extremely costly. Over 1.8 billion people were living under drought conditions in 2022–2023. Drought-related damages, intensified by land degradation, groundwater depletion and climate change rather than rainfall deficits alone, already amount to about US$307 billion per year worldwide—larger than the annual GDP of almost three-quarters of UN Member States.

Water quality degradation is shrinking the truly usable resource base. In many basins, pollution from untreated or inadequately treated wastewater, agricultural runoff, industrial and mining effluents, and salinization means that a growing share of water is no longer safe or economically viable for drinking, food production or ecosystems—even where nominal volumes have not yet declined dramatically.

The planetary freshwater boundary has been transgressed. Global evidence shows that two important elements of the freshwater cycle—"blue water" (surface and groundwater) and "green water" (soil moisture)—have been pushed beyond a safe operating space, alongside planetary boundaries for climate, biosphere integrity, and land systems

Existing governance and agendas are no longer fit for purpose. In many basins, the sum of legal water rights, informal expectations and development promises far exceeds degraded hydrological carrying capacity in the absence of effective governance institutions to address water bankruptcy. The current global agenda focused primarily on WASH (Water, Sanitation, and Hygiene), incremental efficiency gains and generic IWRM (Integrated Water Resources Management) prescriptions is insufficient to address structural overshoot, irreversibility and the rising risks of social instability and conflict associated with water bankruptcy.

EXECUTIVE SUMMARY

The Visible Face of Water Bankruptcy: This sinkhole in the Konya Plain, Türkiye, represents the literal collapse of the landscape under hydrologic liquidation. As of late 2025, nearly 700 such caverns scarred Türkiye's agricultural heartland—a direct result of extracting groundwater much faster than nature can replenish it. Depletion of aquifers for cultivation of water-intensive crops like maize and sugar beet, and reduced groundwater recharge under drought, has stripped the soil of its structural support, turning the nation's breadbasket into a landscape of shared risk. Photo: Ekrem07, Wikimedia Commons (October 2023)

Water is the quiet infrastructure of everything the United Nations cares about: human security and prosperity, food and energy security, biodiversity, environmental resilience, public health, climate stability, and peace. The UN Sustainable Development Goal 6 (SDG 6) captures this centrality by committing the world to ensuring the availability and sustainable management of water and sanitation for all. Yet, **the world is still very far from meeting SDG 6**. About 2.2 billion people still lack safely managed drinking water, 3.5 billion lack safely managed sanitation, and about 4 billion people experience severe water scarcity for at least one month per year. Nearly 75% of the world's population lives in countries classified as water-insecure or critically water-insecure with progress toward SDG 6 is far off track for 2030. These figures indicate that **water-related risks are now systemic rather than marginal.**

For decades, the global policy and science communities have warned of an escalating "water crisis" and called for accelerated action to avert it. Those warnings were not wrong, but they are now incomplete. **The language of crisis—suggesting a temporary emergency followed by a return to normal through mitigation efforts—no longer captures what is happening in many parts of the world**. This report by the United Nations University Institute for Water, Environment and Health (UNU-INWEH) on the 30th anniversary of its inception responds to this gap by offering a new, more precise diagnosis and recommendations for a new governance agenda fitting the water realities of the Anthropocene in the 21st century. The report is a wake-up call and an open invitation to the policy community to use water as a powerful bridge to promote cooperation to address some of the most critical security, peace, justice, development, and sustainability challenges of our time.

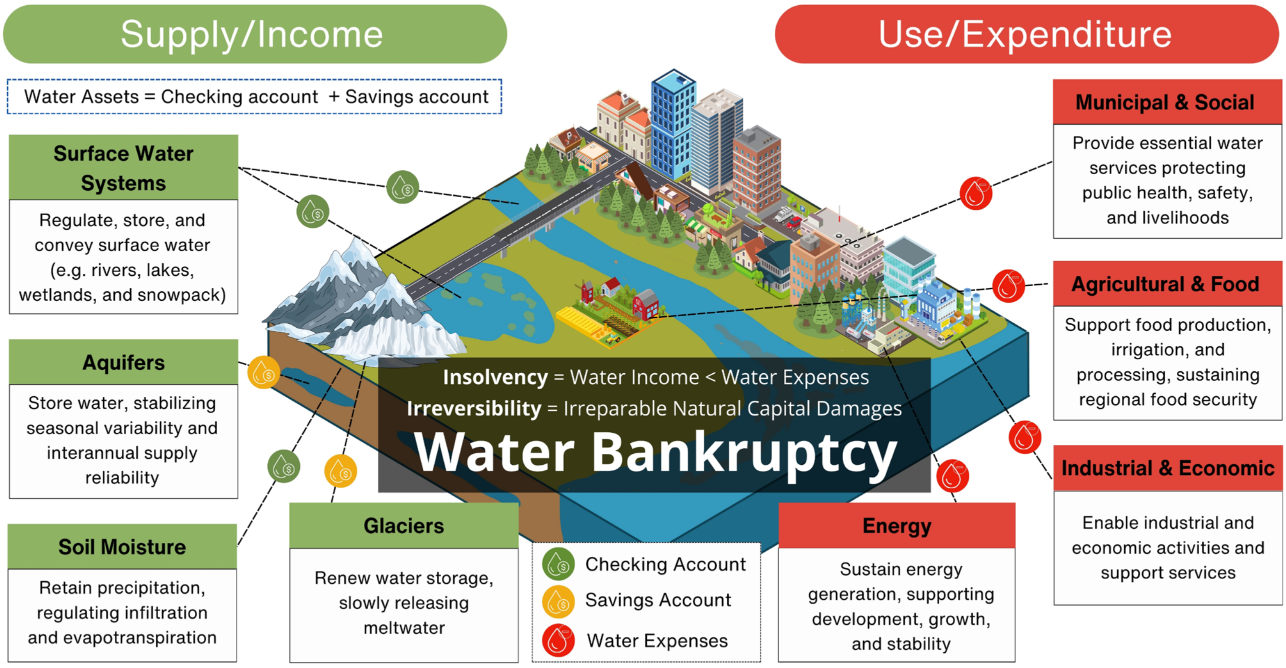
The central message of this report is direct: **the world has entered the era of Global Water Bankruptcy.** In many regions, human–water systems are already in a post-crisis state of failure. Over decades, societies have withdrawn more water than climate and hydrology can reliably provide, drawing down not only the annual "income" of renewable flows but also the "savings" stored in aquifers, glaciers, soils, wetlands, and river ecosystems. At the same time, pollution, salinization, and other forms of water quality degradation have reduced the fraction of water that is safely usable.

The consequences of water bankruptcy are now visible on every continent: rivers that no longer reach the sea; lakes, wetlands, and glaciers that have shrunk or disappeared; aquifers pumped down until land subsides and salt intrudes; forests and peatlands drying and burning; deserts and dust storms expanding, and cities repeatedly brought to the brink of "Day Zero." These are not simply signs of stress or episodes of crisis. They are **symptoms of systems that have overspent their hydrological budget and eroded the natural capital that once made recovery possible**, with knock-on effects for food prices, employment, migration and geopolitical stability.

The report calls for the recognition of the state of **'Water bankruptcy' as a persistent post-crisis condition of a human–water system in which long-term water use has exceeded renewable inflows and safe depletion limits, causing irreversible or effectively irreversible degradation** such that previous levels of water supply and ecosystem functions cannot realistically be restored. In a bankruptcy state, some damages are physically irreparable on human time scales: compacted aquifers do not rebound, subsided deltas do not rise, extinct species do not return, and lost lakes cannot be restored within planning horizons. Others are technically reversible only at costs so high, or over periods so long, that they are effectively irreversible for policy and planning purposes. This is what distinguishes water bankruptcy from two better-known states: water stress, where high pressure still allows recovery, and water crisis, where an acute, time-bound shock can in principle be overcome.

Water bankruptcy is not only about the 'insolvency' of the system but also about its 'irreversibility'. The shift from crisis to bankruptcy has profound implications for how the world approaches both mitigation and adaptation. Crisis management is essentially restorative: it aims to survive a shock and get back to the previous normal, often through mitigation efforts, short-term emergency measures, and supply-side fixes. Bankruptcy management is different. In finance, declaring bankruptcy is the precondition for a fresh, more sustainable start: debts are recognized, claims are written down, and a new balance sheet is constructed to prevent further collapse. In the same way, managing water bankruptcy calls for a transformational fresh start in human–water relations. **It demands a deliberate combination of efforts for mitigation plus adaptation to new hydrological and environmental normals**.

Bankruptcy management **acknowledges the failure of the current development system and water management model and irreversibility of some damages**, while recognizing the urgency of preventing additional damages through transformative reforms. Mitigation attempts seek not only to restore the lost past but also to avoid pushing more basins into bankruptcy and to slow the erosion of remaining water-related natural capital. In the meantime, adaptation efforts are focused on



A simple illustration of water income and water expenses in a human–water system. Water bankruptcy is the outcome of both insolvency and irreversibility conditions, i.e., when water use (expenditure) exceeds water supply (renewable and non-renewable assets) for an extended period resulting in irreparable damages to the underlying natural capital that contributes to water production and stability of the hydrological cycle.

functioning more efficiently within tighter hydrologic limits through reconfigured economics, governance institutions, and development models, while recognizing non-stationary climatic and changed environmental conditions.

The report **reframes the water governance challenge for a post-crisis era**. Rather than asking only how to avoid a future water crisis, it asks what it means to govern human–water systems on a water-bankrupt planet: how to admit insolvency where it exists; how to manage irreversibility honestly; how to share unavoidable losses fairly; and how to design institutions, development pathways, and financial frameworks that prevent further overspending of hydrological capital and damage to the underlying natural capital.

The report emphasizes that water bankruptcy is also **a justice, security and political economy challenge**. Water bankruptcy management must therefore be explicitly equity-oriented: securing basic human needs and critical services; safeguarding environmental flows; providing compensation and social protection where livelihoods must change; and strengthening grievance and conflict resolution mechanisms at local, national, and transboundary levels. Without this justice lens, necessary reforms risk fueling social unrest and undermining the political viability of transitions.

Finally, the report situates Global Water Bankruptcy within the wider multilateral landscape and the realities of a fragmented world. It argues that the current global water agenda—focused primarily on safe drinking water, sanitation and hygiene (WASH), incremental efficiency gains and generic IWRM prescriptions—is no longer fit for purpose in the Anthropocene or for an era of growing geopolitical tensions and stalled multilateral processes. It calls for a new water agenda that recognizes water as both a constraint and an opportunity sector for achieving the goals of the Rio Conventions and the 2030 Agenda, aligning local and national priorities with global climate, biodiversity and land commitments, and **offering common ground between the Global North and Global South as well as between rural and urban, left and right constituencies**. It proposes that water be used as a bridge between fragmented policy arenas and a divided world, helping to re-energize stalled negotiations on the triple planetary crisis. The upcoming UN Water Conferences in 2026 and 2028, the conclusion of the International Decade for Action “Water for Sustainable Development” in 2028, and the 2030 deadline for SDG 6 are identified as critical milestones for embedding water-bankruptcy diagnostics, monitoring frameworks and just-transition support into global governance.

This UNU-INWEH report is not another warning about a crisis that might arrive in the future. **It is a declaration that the world is already living beyond its hydrological means and that many human–water systems are operating in a state of water bankruptcy.** Recognizing this post-crisis reality is not an act of resignation; it is the starting point for a more honest, science-based and justice-oriented agenda that uses mitigation and adaptation to build a fresh, more sustainable balance between societies and the water on which they depend—before the remaining natural capital is lost.

KEY POLICY MESSAGES

The world is already in the state of "water bankruptcy". In many basins and aquifers, long-term overuse and degradation mean that past hydrological and ecological baselines cannot realistically be restored. While not every basin or country is water-bankrupt, enough critical systems around the world have crossed these thresholds—and are interconnected through trade, migration, climate feedbacks, and geopolitical dependencies—that the global risk landscape is now fundamentally altered.

The familiar language of "water stress" and "water crisis" is no longer adequate. Stress describes high pressure that is still reversible; crisis describes acute, time-bound shocks. Water bankruptcy must be recognized as a distinct post-crisis state, where accumulated damage and overshoot have undermined the system's capacity to recover.

Water bankruptcy management must address insolvency and irreversibility. Unlike financial bankruptcy management, which deals only with insolvency, managing water bankruptcy is concerned with rebalancing demand and supply under conditions where returning to baseline conditions is no longer possible.

Anthropogenic drought is central to the world's new water reality. Drought and water shortage are increasingly driven by human activities—over-allocation, groundwater depletion, land and soil degradation, deforestation, pollution, and climate change—rather than natural variability alone. Water bankruptcy is the outcome of long-term anthropogenic drought, not just bad luck with hydrological anomalies.

Water bankruptcy is about both quantity and quality. Declining stocks, polluted rivers, and degrading aquifers, and salinized soils mean that the truly usable fraction of available water is shrinking, even where total volumes may appear stable.

Managing water bankruptcy requires a shift from crisis management to bankruptcy management. The priority is no longer to "get back to normal", but to prevent further irreversible damage, rebalance rights and claims within degraded carrying capacities, transform water-intensive sectors and development models, and support just transitions for those most affected.

Governance institutions must protect both water and its underlying natural capital. The existing institutions focus on protecting water as a good or service disregarding the natural capital that makes water available in the first place. Efforts to protect a product are ineffective when the processes that produce it are disrupted. Recognizing water bankruptcy calls for developing legal and governance institutions that can effectively protect not only water but also the hydrological cycle and natural capital that make its production possible.

Water bankruptcy is a justice and security issue. The costs of overshoot and irreversibility fall disproportionately on smallholder farmers, rural and Indigenous communities, informal urban residents, women, youth, and downstream users, while benefits have often accrued to more powerful actors. How societies manage water bankruptcy will shape social cohesion, political stability, and peace.

Water bankruptcy management combines mitigation with adaptation. While water crisis management paradigms seek to return the system to normal conditions through mitigation efforts only, water bankruptcy management focuses on restoring what is possible and preventing further damages through mitigation combined with adaptation to new normals and constraints.

The world has an untapped, strategic opportunity to capitalize on water as a powerful bridge in a fragmented world. Water can align national priorities with international priorities and improve cooperation between and within nations. Roughly 70% of global freshwater withdrawals are used for agriculture, much of it by farmers in the Global South. Elevating water in global policy debates can help rebuild trust not only between the Global South and Global North, but also within countries—bridging rural and urban communities and easing polarization across left and right constituencies

Water must be recognized as an upstream sector. Most national and international policy agendas treat water as a downstream impact sector where investments are focused on mitigating the imposed problems and externalities. The world must recognize water as an upstream opportunity sector where investments have long-term benefits for peace, stability, security, equity, economy, health, and the environment.

Water is an effective medium to fulfill the global environmental agenda. Investments in addressing water bankruptcy deliver major co-benefits for the global efforts to address its environmental problems while addressing the national security (e.g., employment, national stability, and food security) concerns of the UN member states. Elevating water in the global policy agenda can renew international cooperation, increase the efficiency of environmental investments, and reaccelerate the halted progress of the three Rio Conventions to address climate change, biodiversity loss, and desertification.

A new global water agenda is urgently needed. Existing agendas and conventional water policies—focused mainly on WASH, incremental efficiency gains and generic IWRM guidelines—are not sufficient for the world's current water reality. A fresh water agenda must be developed that takes Global Water Bankruptcy as a starting point and uses the 2026 and 2028 UN Water Conferences, the conclusion of the Water Action Decade (2028), and the 2030 SDG 6 timeline as milestones for resetting how the world understands and governs water.

CHAPTER 1

FROM WATER CRISIS TO WATER BANKRUPTCY

Once one of the largest hypersaline lakes of the world, Lake Urmia in northwest Iran has dried up due to increased upstream water use and diversions that reduced water inflows to the lake, a situation exacerbated by climate change and more frequent droughts, turning the lake bed into a new source of salt and dust storms. This satellite image (Sentinel-2 Level-2A true-color) shows the status of Lake Urmia in July 2025.

1.1 Water at the Core of the Global Agenda

Water is the foundation of human development and planetary stability. It underpins food and energy production, public health, resilient livelihoods, ecosystem integrity, human security, and social and political stability. When water systems fail, the consequences cascade through economies and societies: crops fail, power grids falter, diseases spread, cities become unlivable, farmers lose jobs, communities are forced to move, conflicts arise, and peace and security are compromised.

This centrality is captured explicitly in **Sustainable Development Goal 6 (SDG 6)**, which commits the world to "ensure availability and sustainable management of water and sanitation for all". But SDG 6 is also deeply interconnected with almost every other SDG. Progress on poverty reduction, health, education, gender equality, resilient cities, climate action, life below water and life on land all depend, directly or indirectly, on the stability and integrity of human–water systems.

For years, global policy debates have recognized that water is "everybody's business". Yet, water governance and water-related decision-making remain fragmented. Water is featured in climate negotiations, biodiversity protection frameworks, and desertification debates of the UN Rio Conventions, and is central to development planning and infrastructure investments. But it is still too often addressed through separate sectoral lenses and institutionally siloed processes. This fragmentation obscures a simple fact: the condition of water systems now constrains our collective ability to deliver on the entire 2030 Agenda.

The scale of unmet basic needs underscores this gap between rhetoric and reality while **2.2 billion people lack safely managed drinking water and 3.5 billion lack safely managed sanitation**[1]. Even where services exist, they are often fragile. **Around 6.1 billion people live in areas that are water-insecure or critically water-insecure**[2]. Over the first two decades of the twenty-first century, floods and droughts affected billions of people worldwide and together accounted for the majority of disaster events and impacts on people[3]. Water insecurity is therefore not an isolated development challenge but a systemic constraint on the entire 2030 Agenda.

Vulnerability to Water-Related Challenges

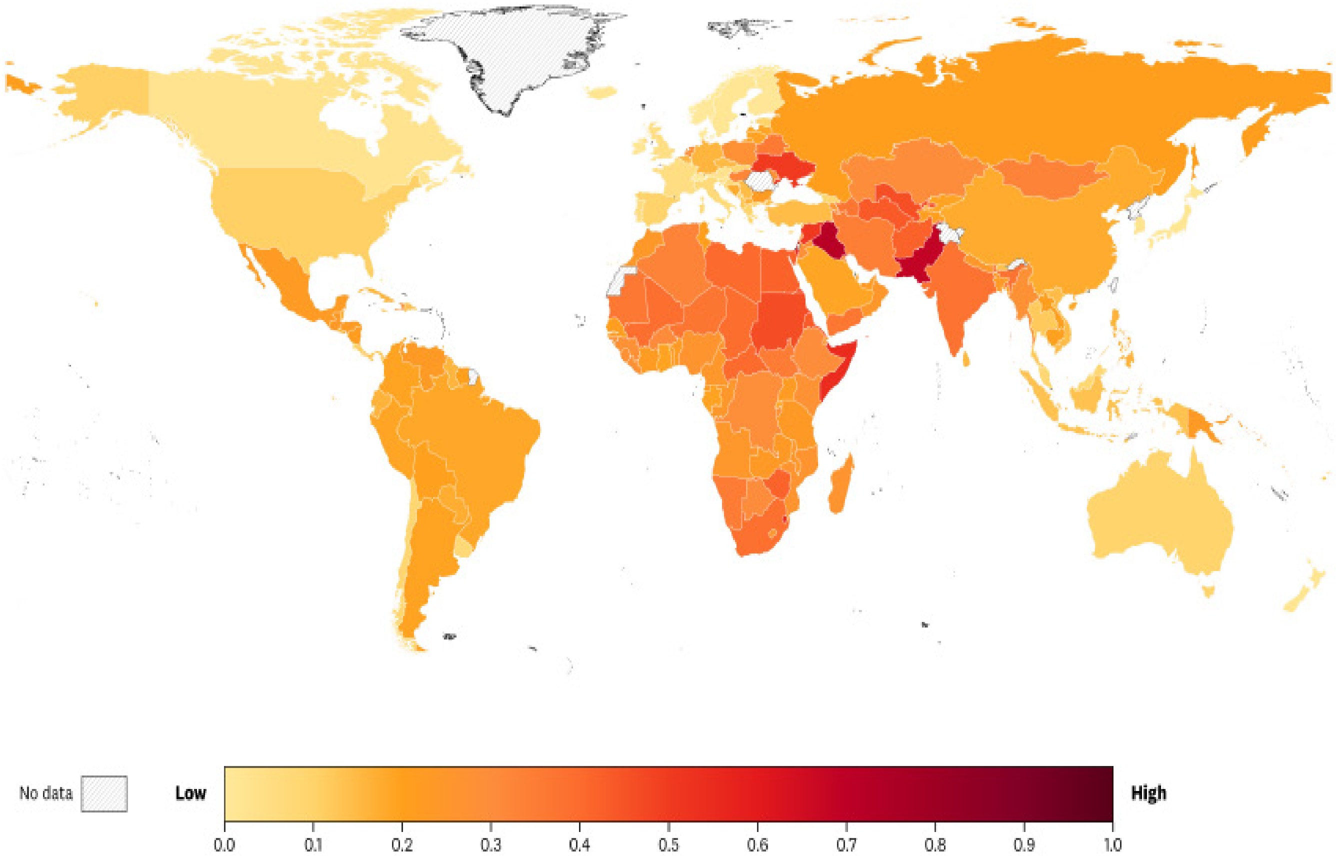
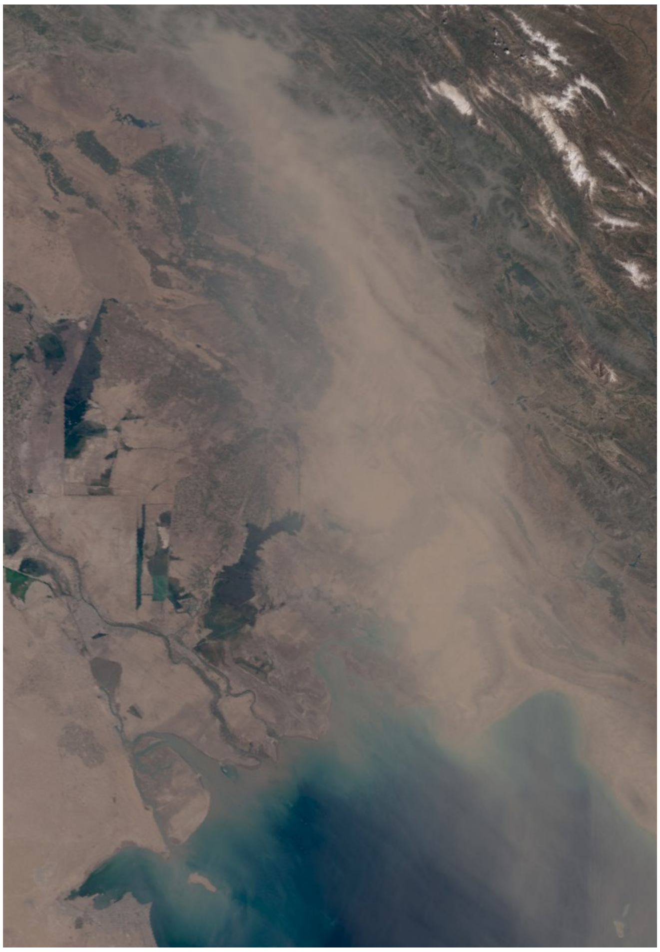


Figure 1. Baseline vulnerability of different nations to water-related challenges. This index reflects the susceptibility of a region to water-related challenges, considering its environmental, social, and economic conditions. Map produced based on data from Water Resources Vulnerability Monitor.

1.2 The Crisis Narrative: Useful But No Longer Sufficient

Over the last four decades, the dominant global narrative has been that the world faces an escalating **"global water crisis".** Reports and campaigns have warned of looming shortages, increasing droughts, growing competition between users in different parts of the world, and even the possibility of wars over water. The crisis framing has been effective in mobilizing attention and resources. It helped elevate water onto global agendas, justify investments, and spur the creation of SDG 6.

Yet "crisis" carries a specific connotation. In risk and disaster management, a crisis is understood as an exceptional, time-bounded departure from normal conditions, triggered by a shock such as drought, flood, contamination, or infrastructure failure. The task of crisis management is to survive the shock and restore the system to something close to its previous state through mitigation efforts[4]. Implicit in this logic is the **belief that the baseline itself remains viable**[5]: if only we can get through this drought, fix this dam, clean this river, the system will again function as before.



Sand and dust storms blanketing Iraq, Iran, Saudi Arabia, and the United Arab Emirates (UAE), intensified by dry conditions, sent thousands to hospitals in April 2025. This satellite image from Sentinel-3 OLCI shows a thick dust plume near the Iran-Iraq border on 15 April 2025.

The Dead Sea, a landlocked salt lake bordering Jordan, Israel, and the West Bank of Palestine, has shrunk significantly since 1930s, mainly due to the diversion of water from its primary source, Jordan River. This satellite image (from Sentinel-2 Level-2A true-color) shows the state of the lake, its exposed lakebed, and the series of saltwater evaporation ponds in its southern part in June 2025.

In many parts of the world, however, this assumption no longer holds. The crisis narrative tends to blur together fundamentally different situations: places where temporary shocks strike otherwise robust systems; places where chronic overuse and degradation have already eroded natural buffers and shifted baselines; and places where the damage done to rivers, lakes, aquifers, glaciers, and ecosystems is irreversible or effectively irreversible on human time scales.

By continuing to describe all of these trends, degrading conditions, and lasting damages as "crises", global discourse sustains the illusion that improved crisis management alone will suffice and the crises can be mitigated. It suggests that with more infrastructure, better coordination, and stronger emergency responses, the world can "return" to a desirable past state. In many systems, however, that past state **no longer exists**.

1.3 The Water Reality of the Anthropocene

The current era is increasingly described as *the Anthropocene*: a term used to capture the extent to which human activities now dominate and reshape key components of the Earth system. It is marked by the scale and speed of human-driven change in climate, land use, biogeochemical cycles, and biodiversity, far beyond the range of natural variability in recent history. **Water is at the center of this transformation**.

Over the past century, societies have drastically reconfigured the global water cycle. Dams, diversions, drainage works, and canals have transformed river systems. Irrigation, land-use change, and groundwater pumping have altered evapotranspiration and recharge patterns. Greenhouse gas emissions have warmed the atmosphere and oceans, changing precipitation regimes, snowpack, glacier mass balance and the intensity of extremes. Population growth, urbanization, and economic expansion have increased water demand for agriculture, industry, energy and cities.

These pressures have produced a global pattern that is now unmistakable. Major rivers run dry for part of the year or fail to reach the sea. Lakes and wetlands have shrunk or disappeared, taking with them fisheries, habitats and local climate-regulating functions. Aquifers have been pumped beyond their recharge, leading to declining water levels, land subsidence, salinization and the permanent loss of storage capacity. Glaciers and snowpacks that once provided reliable baseflows and seasonal water storage are retreating rapidly. Forests, peatlands and soils are drying, burning, eroding and losing their ability to regulate water and carbon. At the same time, a growing list of cities faces repeated water emergencies and “Day Zero” scenarios despite new infrastructure and emergency interventions.

These trends are not solely the impact of climate change. They are not simply the result of bad luck or unusual hydrological conditions, either. The chronic conditions we observe around the world are **the cumulative outcome of decisions that have systematically overspent hydrological capital**. In many regions, what used to be an occasional drought has morphed into a near-permanent deficit: a human-made condition in which water shortages persist even in years with “normal” rainfall, because demands and expectations have outgrown the hydrological carrying capacity, i.e., what the system can sustainably provide.

Alongside these physical changes, water quality has deteriorated in many systems. Nutrient enrichment from agriculture, untreated and partially treated municipal and industrial wastewater, mining effluents, plastics and emerging contaminants such as pharmaceuticals and personal care products have degraded rivers, lakes and coastal waters. In densely populated catchments, eutrophication, harmful algal blooms, pathogen contamination, and toxic pollution increasingly determine whether water is actually usable for people, food production and ecosystems. In many places, the apparent quantity of water on paper therefore overstates the amount of water that can be safely used.

This is the water reality of the Anthropocene. It is characterized not only by increased variability and extremes but also by the **structural depletion of water capital and degradation of water-related natural capital**. Water systems have passed their tipping points in many regions with irreversible ecosystem damages and baseline service declines that have further accelerated environmental degradation and climate change. Humanity has already pushed the freshwater cycle beyond its safe operating space, alongside boundaries for climate, biosphere integrity, and land systems[6]. In other words, the Anthropocene’s water reality is not just one of more frequent and intense extremes; it is a global hydrological regime that is already outside the range that supported stable conditions in the past. It is this reality that makes the familiar language of “stress” and “crisis” insufficient.

Polluted canal in a poor area built on swamps, Antananarivo, central Madagascar (September 2016). Photo: Thibaut Vergoz, IRD

1.4 From Warning to Diagnosis: Declaring Global Water Bankruptcy

The warnings about a global water crisis were necessary and timely. However, they were framed as alerts about a future that could still be avoided. This UNU-INWEH report warns that the world has already moved into a new phase. The question is no longer whether a crisis can be averted everywhere, but how to govern in a world where many human–water systems have already failed to the point that previous conditions cannot be restored.

To capture this new condition, the report adopts the newly developed **water bankruptcy** concept[5, 7]. The notion of "water bankruptcy" builds on a simple but powerful analogy with financial bankruptcy. In finance, bankruptcy is declared when an entity has spent beyond its means for so long, and accumulated such unsustainable debts, that it cannot meet its obligations. **Declaring bankruptcy is both an admission of failure and the first step toward a fresh start**: claims are written down, expectations are reset, and a new, more realistic balance sheet is negotiated to prevent further collapse.

Applied to water, the concept rests on three core features[5]. First, water systems function like bank accounts: humans can draw down both annual "income" and long-term "savings", using renewable water resources (for example, rivers, reservoirs, soil moisture, and snow) as a **checking account** and non-renewable or very slowly renewable resources (for example, groundwater and glaciers) as a **savings account**. Second, in many places these accounts have been **systematically overdrawn**, with withdrawals exceeding renewable inflows and safe depletion limits for years or decades, degrading the natural capital that once underpinned resilience. Third, as a result, some of the **damage is irreversible** or effectively irreversible on human time scales, so that full restoration of previous levels of water supply and ecosystem function is no longer a realistic goal, even with substantial investments and favorable climate conditions. When this happens, a system is not merely stressed or in crisis; it is **water-bankrupt**. It has moved into a post-crisis state in which the old normal is gone and continued insistence on restoration only deepens the losses.

This report declares that **the global human–water system as a whole has already entered the era of Global Water Bankruptcy**. While not every basin or country is water-bankrupt, enough critical systems around the world have crossed these thresholds—and are interconnected through trade, migration, climate feedbacks, and geopolitical dependencies—that the global risk landscape is now fundamentally altered.

Declaring Global Water Bankruptcy is not an exercise in rhetorical escalation. It is a necessary act of diagnosis. Without naming the condition accurately and adopting a proper discourse, governance will continue to be organized around the wrong question: how to "get through" a crisis and go back to how things were, rather than how to manage a permanent, post-crisis state and transform its institutions to establish a fresh, more sustainable relationship between societies and water.

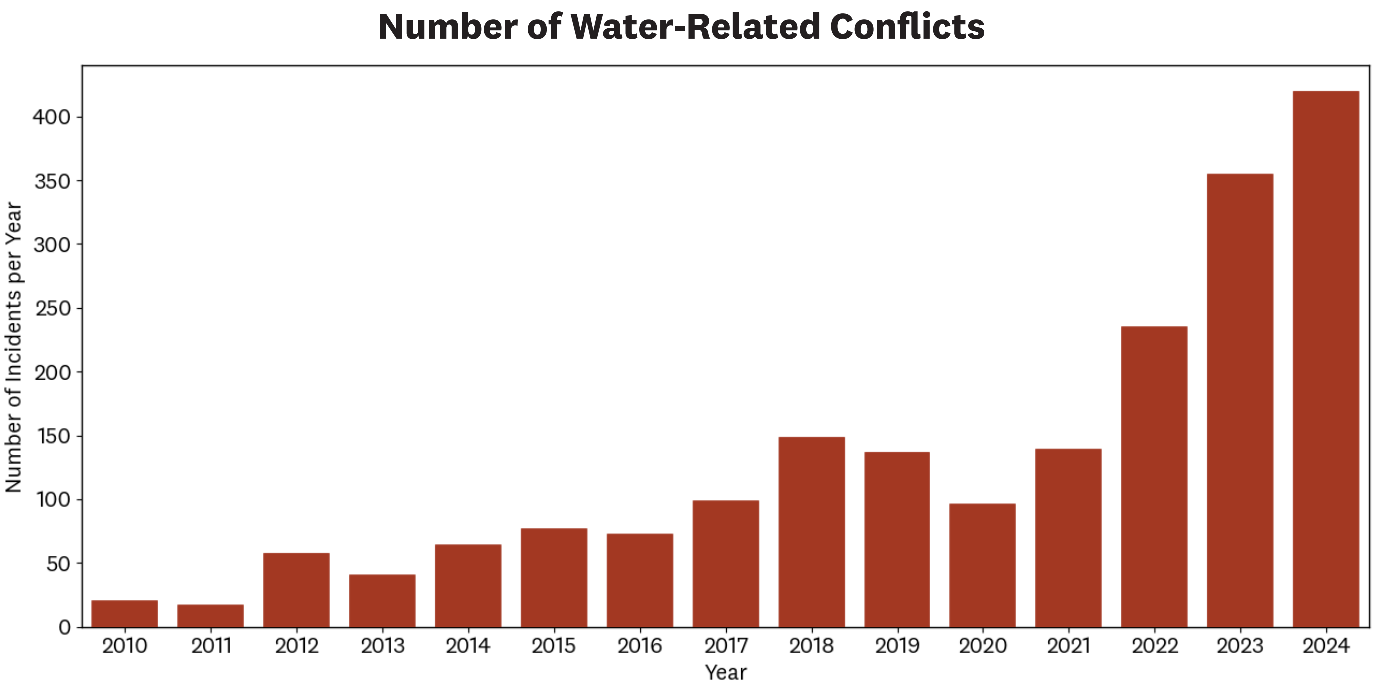


Figure 2. Annual number of water-related conflicts worldwide. The chart highlights an increase in number of water-related conflict incidents over time. Chart produced based on data from the Water Conflict Chronology, The World's Water.

1.5 Purpose, Scope and Audience of the Report

The purpose of this UNU-INWEH report is threefold:

I. **To provide a clear understanding of the water bankruptcy concept**[5] and a simple typology that distinguishes between water stress, water crisis, and water bankruptcy.

II. **To establish that the world has already entered the water bankruptcy era** in the sense that many human–water systems are operating in a post-crisis failure mode with irreversible damages.

III. **To call for global action on water bankruptcy and establish a transformative agenda for water governance in a post-crisis era**, in which managing and adapting to bankruptcy—rather than endlessly mitigating crises—becomes the central task.

The scope of the report is global, but it does not aim to provide an exhaustive catalogue of all water problems or case studies. Instead, it focuses on the systemic features that define water bankruptcy, illustrates them with representative examples, and draws out their implications for policy and governance at national and international levels.

The primary **audience** for this report is:

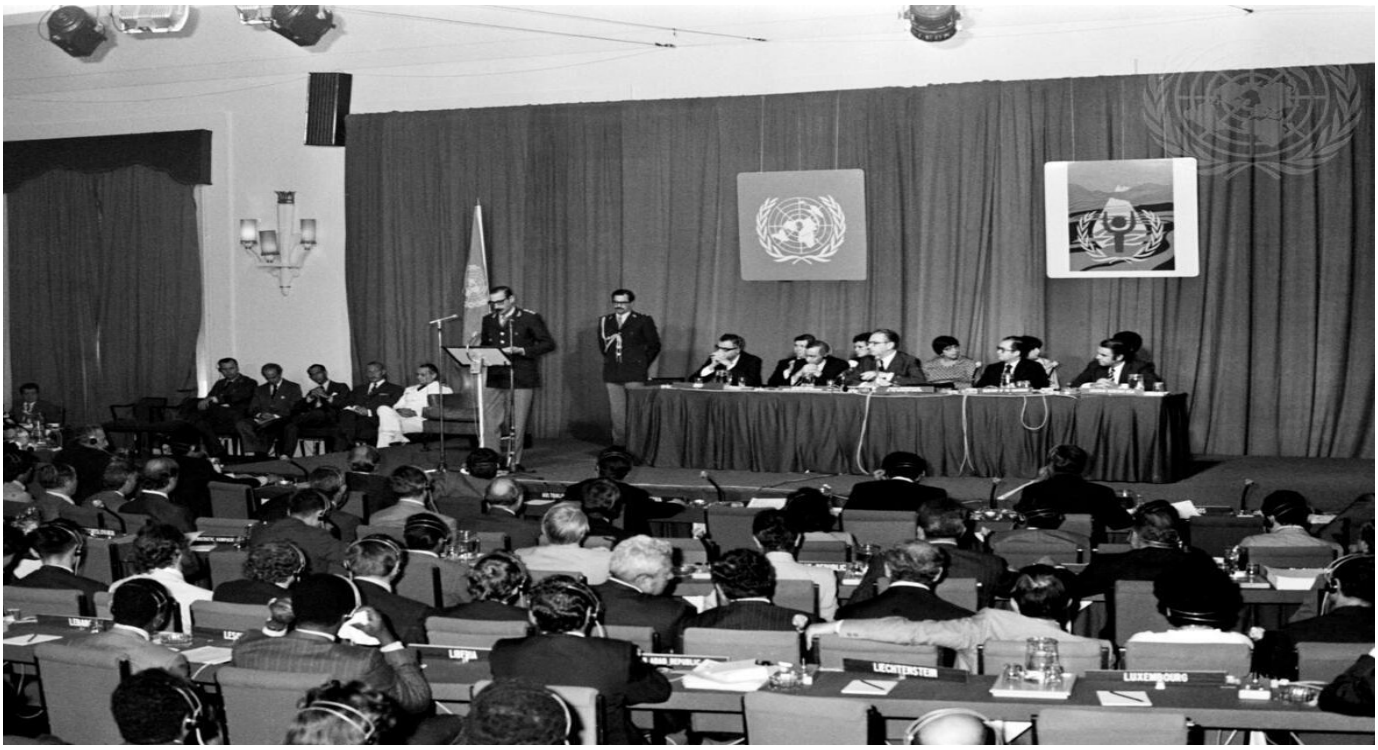
a. **Member States and national and subnational policymakers**, particularly those responsible for water, environment, climate, agriculture, energy, urban development, and finance;

b. **International organizations and UN entities**, including UN-Water as the coordination mechanism for water and sanitation as well as the institutions engaged with SDG 6 implementation, climate and biodiversity negotiations, and desertification and land-degradation mitigation agendas;

c. **Basin organizations, water utilities, and city and local governments,** which must increasingly operate in water-bankrupt or near-bankrupt conditions;

d. **Civil society, research community, and the media**, which play a key role in shaping public understanding and holding institutions accountable.

This UNU-INWEH report serves as a **wake-up call on Global Water Bankruptcy** and a step forward in elevating water in the global policy and cooperation agendas by clarifying what bankruptcy management means for mitigation, adaptation, development planning, justice, and international cooperation. The report argues that acknowledging Global Water Bankruptcy is not an act of resignation, but the **starting point for a more honest, science-based and justice-oriented transformation**—one that aims to prevent further irreversible losses and to build a fresh, more sustainable balance between societies and the water on which they depend.



President Jorge Rafael Videla of Argentina, addressing the opening session of the First United Nations Water Conference—the world's first intergovernmental meeting on problems of ensuring adequate water supplies for the future—in Mar del Plata, Argentina. Delegates from 105 countries, as well as from dozens of intergovernmental and non-governmental organizations, were present at the opening meeting on 14 March 1977. Photo: UN

CHAPTER 2

THE POST-CRISIS ERA: WHEN THE SYSTEM NO LONGER REBOUNDS

Environmental degradation due to dryland salinity, causing trees to die and inducing serious hillslope gully and sheet erosion at the base of a mesa landscape west of Charters Towers, Northern Queensland, Australia. Photo: CSIRO, Wikimedia Commons

2.1 New Normals

The impacts of the chronic drawdown of both surface water and groundwater resources go beyond human-water systems. These trends continue to destroy and degrade the silent stakeholder: the environment. They liquidate our natural capital.

The degrading natural capital is further intensifying environmental and climatic changes through reinforcing feedback loops. The stationary baseline ecosystem services that we built our societies, economies, and institutions based on no longer exist. The accelerating, degrading changes, which our own actions continue to contribute to, narrow the margin for error in water management, leaving societies more exposed to extremes and less able to smooth variability over time.

The global observations reinforce the picture of a structural overshoot. Many human-water systems are operating beyond their hydrological carrying capacity, with irreversible damages to the environment and global natural capital. In these regions, crisis management aimed at restoring previous production levels without reshaping demand and cropping patterns only deepens the overshoot. Droughts have shifted from being primarily a climate-driven, episodic hazard to being, in many places, a chronic human-made condition. This is a hallmark of water bankruptcy: **what appears on the surface as a crisis is, in fact, a new baseline**.

The patterns observed around the world are not those of a system struggling through a temporary crisis. They indicate that many key renewable water systems have crossed thresholds where full restoration is no longer realistic, even with large investments. The strategic, non-renewable water reserves of many societies have also been drawn down beyond safe depletion limits in large parts of the world. In such places, bankruptcy is not a metaphor but an empirical description: the water-dependent natural capital that once underpinned resilience has been liquidated.

Climate change is accelerating glacier melt and collapse around the world. In May 2025, a glacier collapse in Switzerland caused a landslide which buried and destroyed large parts of the Blatten village. Photo: Beat Ruest, Wikimedia Commons

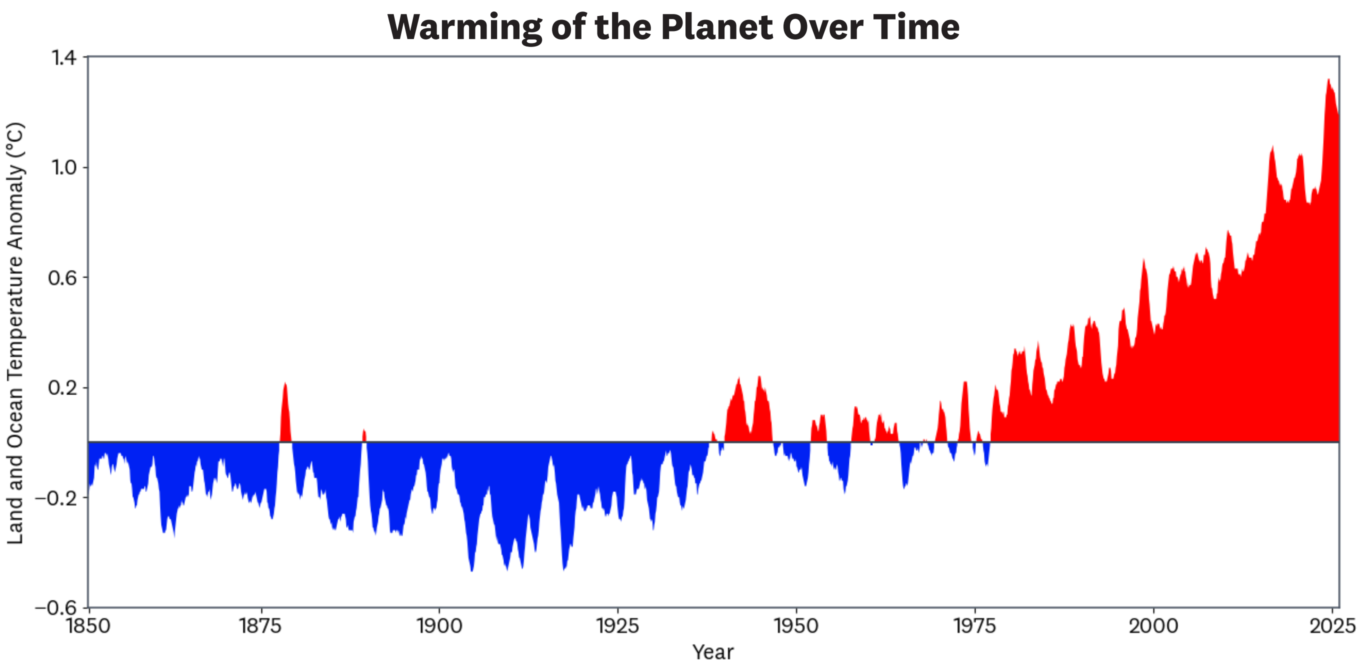


Figure 3. Global land and ocean temperature anomalies. The chart shows how global temperature has increased over time when compared to the 1901-2000 average. Chart produced using the data from NOAA National Centers for Environmental Information, Climate at a Glance: Global Time Series.

2.2 Shrinking Lakes, Altered Rivers and Degrading Wetlands

Despite regional variation, the global trajectory is unmistakable. Surface water bodies are shrinking at unprecedented rates: **more than half of the world's large lakes have declined** since the early 1990s, affecting nearly one-quarter of the global population that relies directly on them for water security[8]. These losses reflect a combination of increased withdrawals, changing inflows, rising temperatures, and land-use change—far more than climate variability alone.

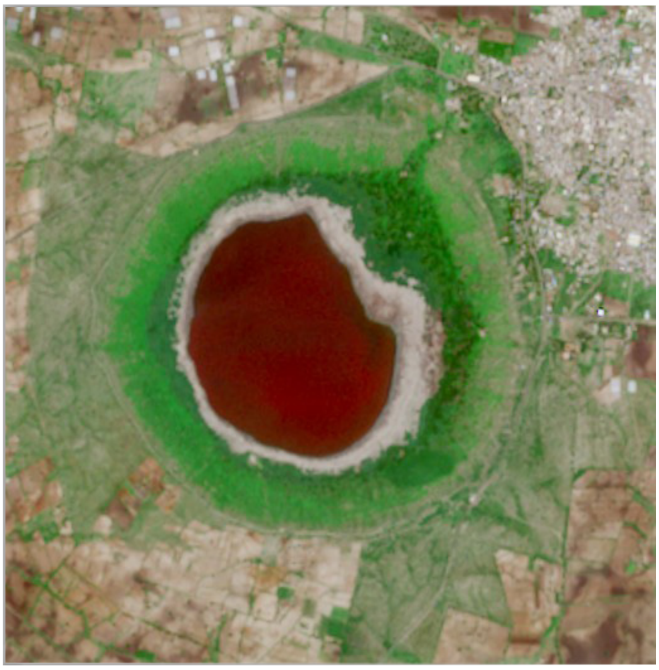
Rivers around the world very well reflect the Anthropogenic water reality. Around **one-third of global river basins experience significant flow alterations**, whether from damming, diversion, over-extraction, or climatic shifts[9]. In some of the world's most densely populated river basins, including the Colorado, Indus, Yellow, Tigris–Euphrates, Murray–Darling, and São Francisco, environmental flows are routinely violated, eroding ecosystems' ability to recover[10]. In many basins, the "normal" to which crisis managers once hoped to return has effectively vanished.

Wetlands—the "shock absorbers" of the water cycle—are vanishing even faster. **Around 35% of natural wetlands have been lost** since 1970, with wetlands disappearing three times more quickly than forests, along with their water-storage and drought-buffering functions[11,12]. A cumulative loss of roughly 410 million hectares (almost the land area of the European Union) of natural wetlands over the last five decades, including an estimated 177 million hectares (roughly the size of Libya or seven times the area of the United Kingdom) of inland marshes and swamps alone, has cost the world over US$5.1 trillion in lost ecosystem services[12]—roughly equivalent to the combined annual GDP of the world's approximately 135 poorest countries, even before accounting for their cultural and intrinsic values. The loss of wetlands is contributing to the sharpest biodiversity declines of any ecosystem type[11] and to the increase in the frequency and intensity of sand and dust storms in some regions, with major economic and health implications[13,14].

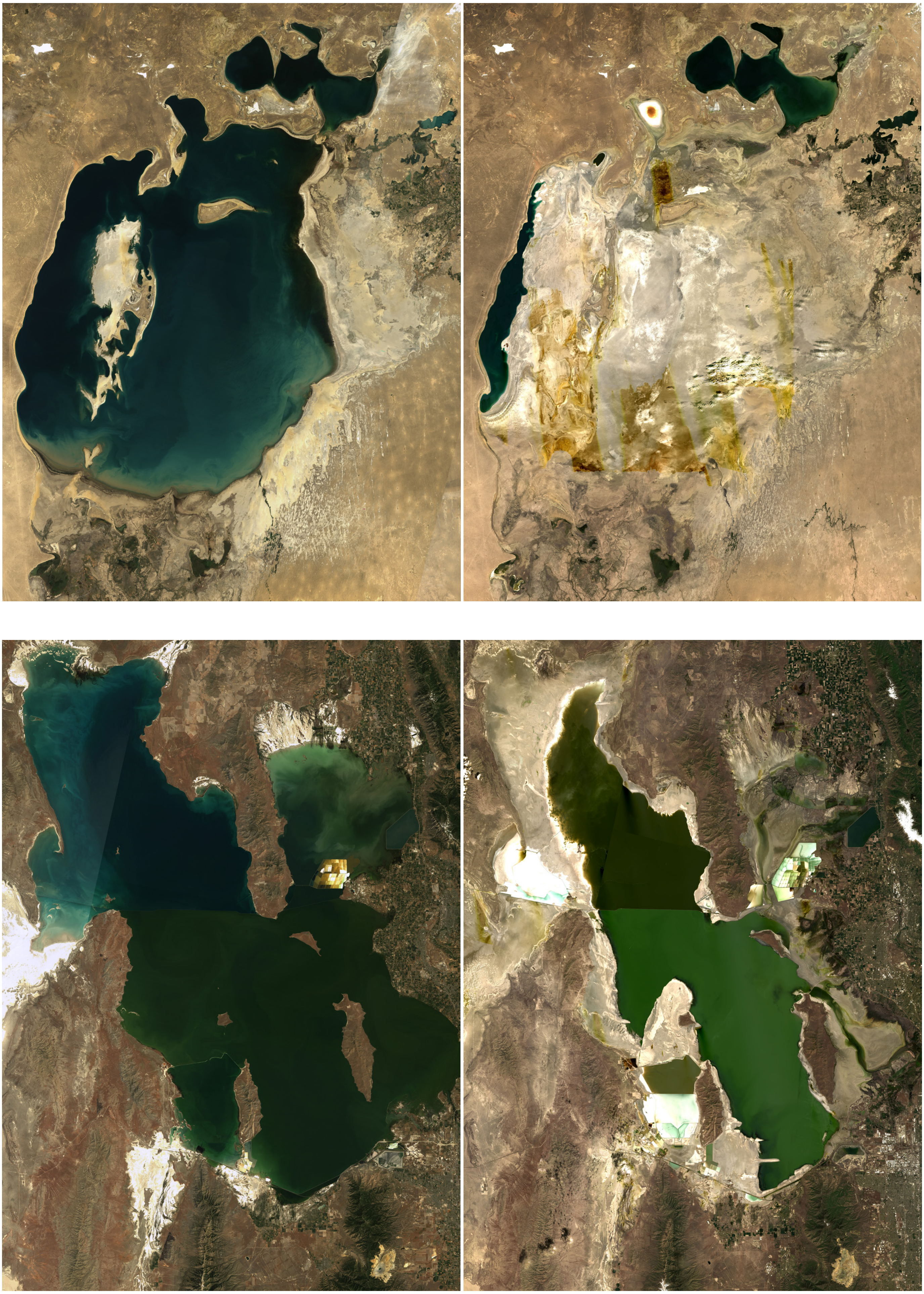
Freshwater biodiversity trends offer a stark warning that these changes are not marginal. Globally, monitored **wildlife populations across all ecosystems have declined by about 73%** on average over the last five decades, but **freshwater vertebrate populations have fallen by an estimated 85%**, a sharper decline than in terrestrial or marine systems[11]. These losses are closely linked to the same drivers that define the water reality in the Anthropocene—flow alteration, pollution, over-extraction, wetland loss and invasive species—indicating that ecological tipping points in rivers, lakes, and wetlands have already been crossed in many regions.

Drying river corridors and wetlands also interact with heat and drought to intensify wildfire risk. In many landscapes, reduced soil and vegetation moisture, drained peatlands, and decreased buffering from surface water **have increased both the frequency and severity of wildfires**, with knock-on effects on air quality, carbon emissions, and watershed function[11,15]. These fire regimes are no longer solely a function of climate variability; they are increasingly a manifestation of long-term hydrological degradation.

Quality degradation further accelerates the functional loss of these surface waters. In many lakes and reservoirs, rising nutrient loads from agriculture and wastewater have intensified eutrophication, harmful algal blooms and hypoxia, undermining fisheries, recreation, and drinking-water supplies and increasing treatment costs[9,16]. Rivers in rapidly urbanizing and industrializing regions frequently carry mixtures of untreated sewage, industrial chemicals, heavy metals and plastics, turning downstream stretches into conveyor belts of contamination rather than sources of safe water[9,16]. As flows decline and wetlands disappear, pollutants become more concentrated and ecological buffers are lost, so that a growing fraction of remaining surface water is no longer usable without expensive treatment or poses unacceptable risks to human and ecosystem health.

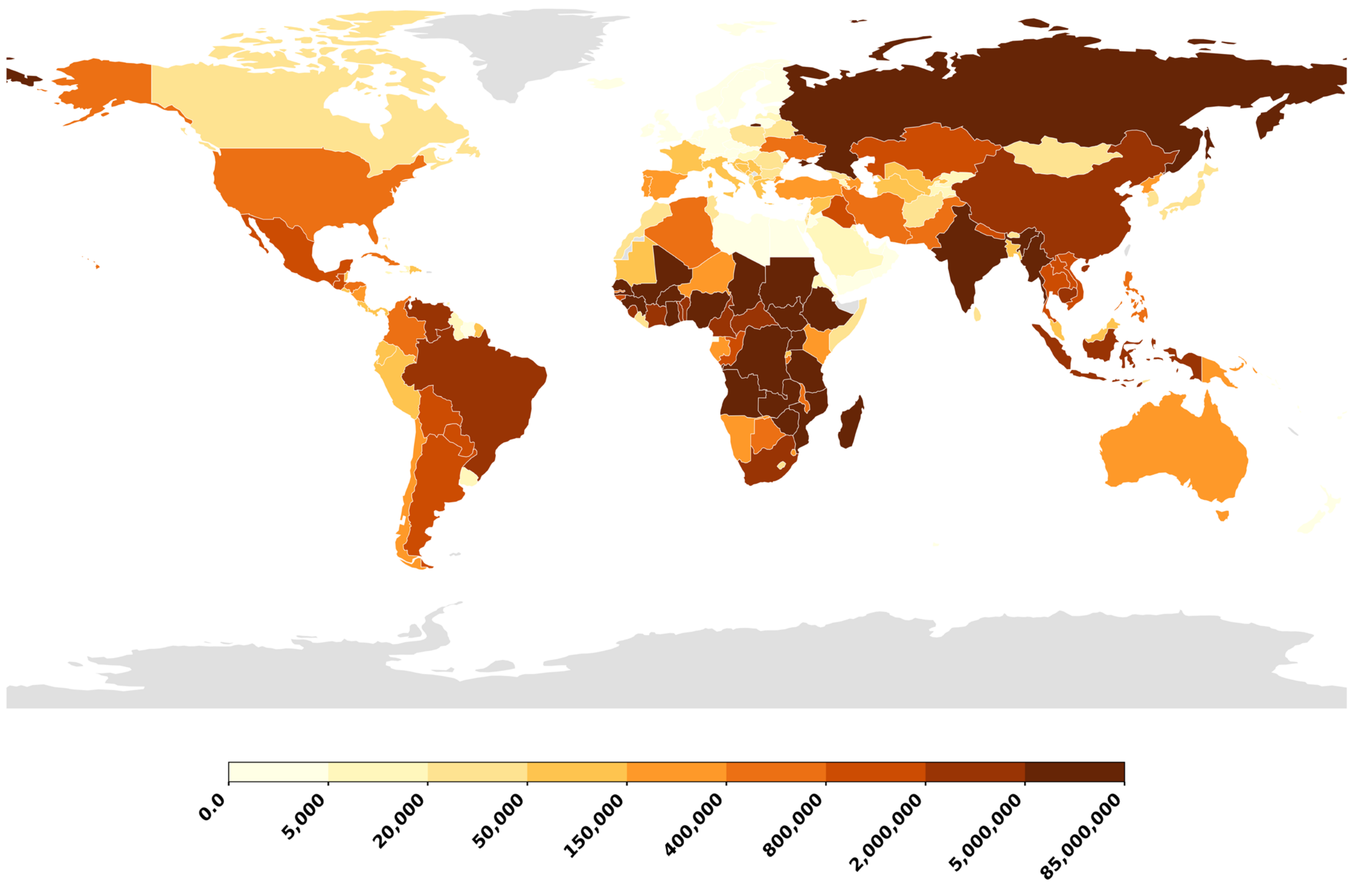


High salt concentrations and microbial activities under lower water levels and warmer temperatures resulted in the pink coloration of Lonar Lake in west-central India in June 2020. Satellite image from Sentinel-2 Level-2A true-color imagery (25 June 2020).



Paired satellite images (4–5 TM and Landsat 8–9 Level-2 true-color) showing the shrinkage of: 1) the world's third largest lake, Aral Sea (1989, top-left vs. 2025 top-right), lying between Kazakhstan and Uzbekistan; and 2) the largest saltwater lake in the Western Hemisphere, Great Salt Lake, U.S.A. (1986, bottom left vs. 2022, bottom-right) due to increased upstream water use and reduced inflows, illustrating parallel declines of large inland lakes.

Cumulative Number of People Exposed to Wildfire



Rate of Increase in Global Human Exposure to Wildfire

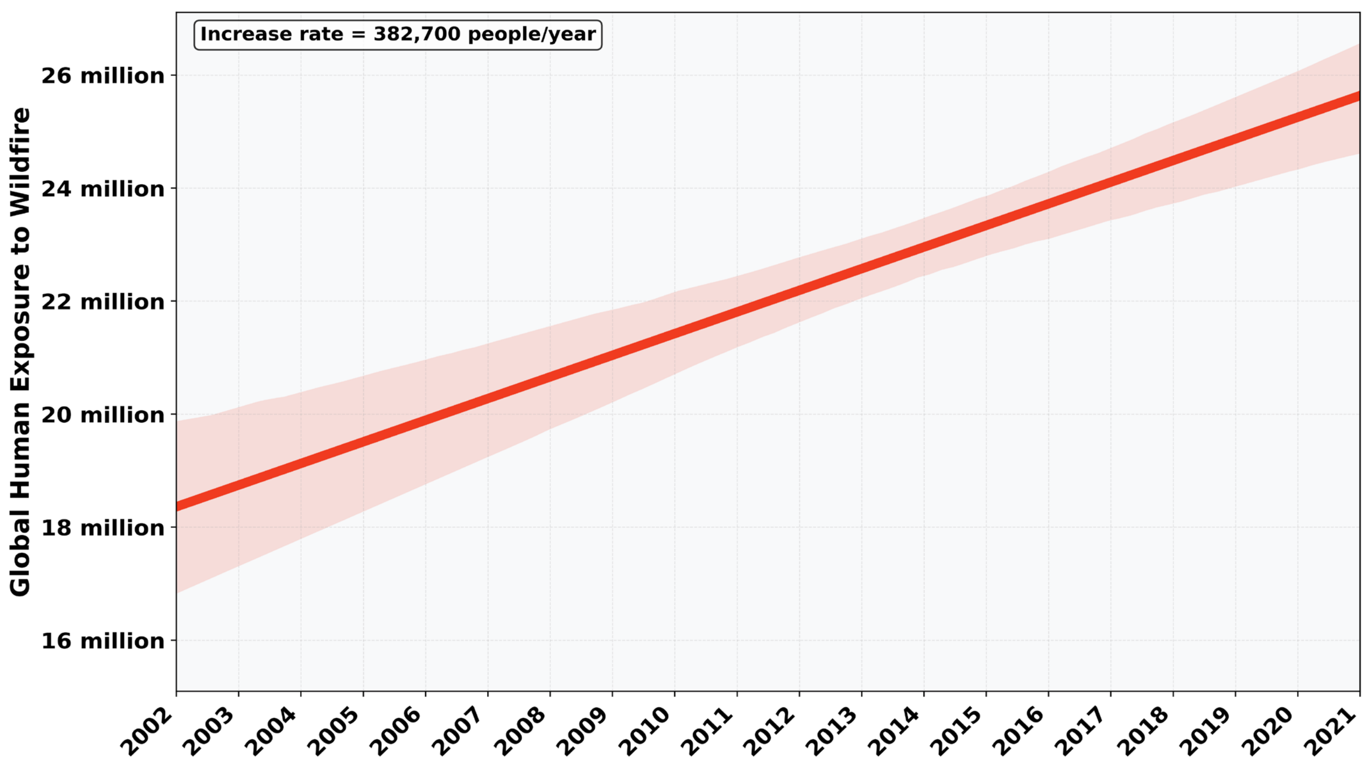


Figure 4. Global human exposure to wildfire. The map on top shows cumulative human exposure to wildfire in each country from 2002-2021 and the plot on the bottom shows the continuous growth in the number of people who are exposed to wildfires globally, mainly driven by the impacts of human activities resulting in global warming and higher temperatures, more frequent droughts, increased water use, reduced water availability, and anthropogenic drought, deforestation, land use changes, and urbanization. Figures produced by Mojtaba Sadegh.

2.3 Groundwater Depletion, Land Subsidence, and Salinization

Groundwater now supplies about 50% of domestic water use and over 40% of irrigation water worldwide, making many urban areas, food systems, and farming communities heavily dependent on aquifers that are being depleted faster than they can recharge[17]. Groundwater depletion continues accelerating, and the planet's groundwater storage is declining. About **70% of the world's major aquifers exhibit long-term declining trends**, many of them effectively irreversible on human time scales due to compaction and loss of aquifer storage capacity[9,18–21]. In parallel, groundwater quality is being degraded by salinity, nitrate and pesticide contamination from agriculture, industrial and mining pollution, and naturally occurring arsenic and fluoride mobilized by deeper pumping, rendering parts of some aquifers physically present but economically and ecologically unusable[16,22].

The consequences of unsustainable groundwater exploitation are already visible on the land surface not only through the increasing appearance of sinkholes. Globally, more than 6.3 million square kilometers, **nearly 5% of the global land area, including 231,000 square kilometers of urban and densely populated areas housing nearly 2 billion people, almost 25% of the global population, are experiencing significant subsidence rates linked to excessive groundwater extraction**[23,24]. In some locations, subsidence rates reach 25 centimeters per year, damaging infrastructure, increasing flood risk, and further compromising deltas and coastal cities. Where aquifers are overdrawn in coastal zones, saltwater intrusion can render groundwater unusable for generations, if not permanently.

Land and soil degradation further amplify these hydrological stresses[25]. **Over 50% of global agricultural land is already moderately or severely degraded**, undermining soil moisture retention and accelerating the transition of drylands toward desertification[26,27]. **Global salinization alone has degraded about 82 million hectares of rainfed cropland and 24 million hectares of irrigated cropland** (together bigger than the total land area of France and Spain combined), undermining soil fertility, contaminating local groundwater and surface water with salts, reducing yields in some of the world's key breadbaskets, and directly threatening food security, health, and livelihoods at local, regional, and global levels[26].

Changes in Terrestrial Water Storage Across the Globe

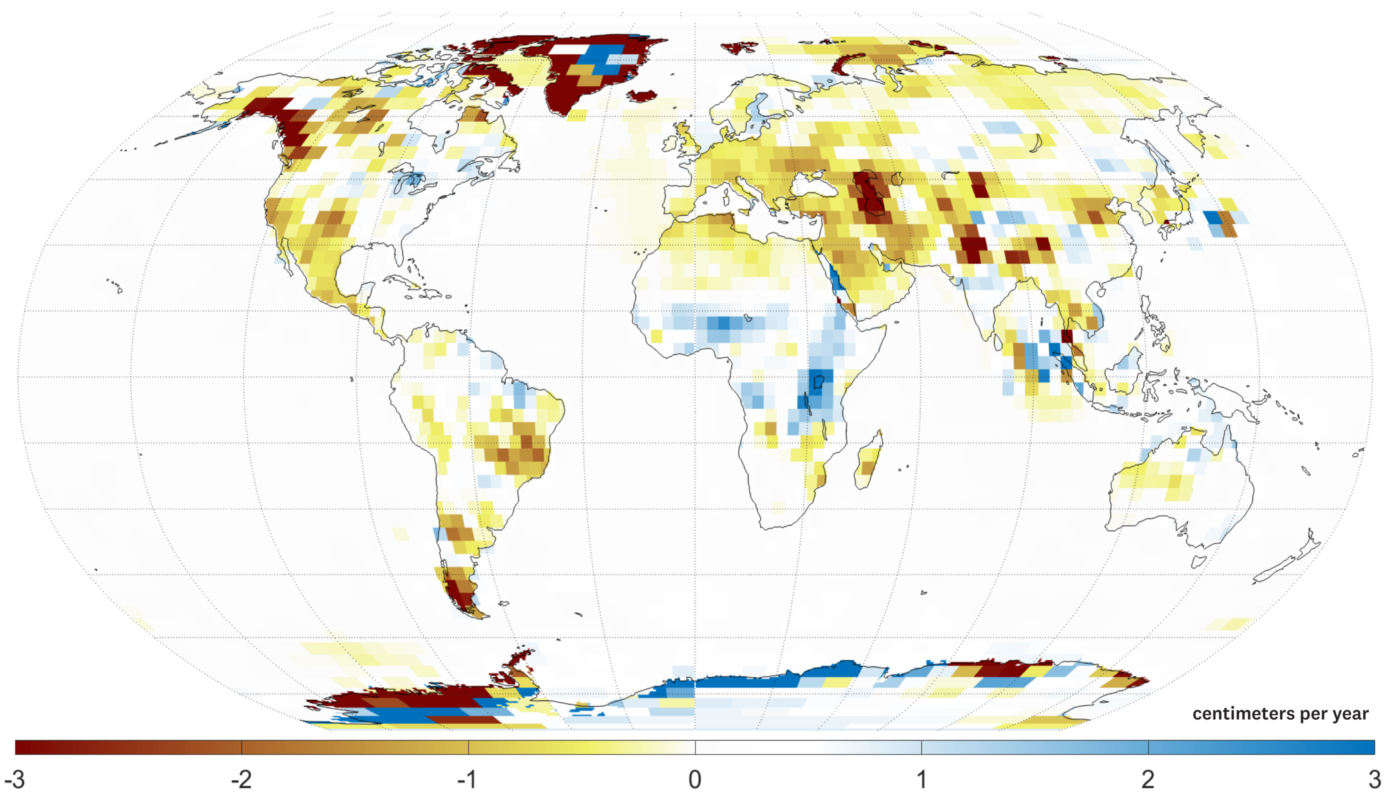


Figure 5. Regional trends in water storage in the twenty-first century. The map shows how terrestrial water storage (TWS) has changed over time in different parts of the world, based on satellite observations from the Gravity Recovery and Climate Experiment (GRACE) and its Follow-On mission (GRACE-FO). The observed trends reveal significant changes in the total amount of water stored on land, including groundwater, soil moisture, rivers and lakes, snow, and ice across the globe. Yellow, orange, and red areas are suffering from water depletion, i.e., negative TWS changes. Figure produced by MJ Tourian.

Degraded soils and vegetation not only reduce the capacity of landscapes to retain water during dry periods; they also alter the way they respond to rainfall. When soils are compacted, eroded, or crusted, their infiltration capacity can decline by up to 90%, so that even moderate storms generate rapid runoff and flash flooding, carrying sediments and pollutants downstream while root zones remain too dry to sustain crops between events[26]. In many drylands and semi-arid regions, this **"drought-flood" paradox**—crop failure during prolonged dry spells followed by destructive flash floods on desiccated, degraded land—has become a defining characteristic of the Anthropocene's water reality, rather than an exception. These land-water feedbacks also reinforce biodiversity loss and desertification. As vegetation cover is reduced and soils lose organic matter, habitats for soil biota and many plant and animal species are degraded or lost, further weakening ecosystem functions such as infiltration, evapotranspiration, and microclimate regulation[11,27]. In many dryland regions, this has contributed to the expansion of desertified areas, increased the frequency and intensity of sand and dust storms[13,14,27], and led to the loss of pastoral and agro-pastoral livelihoods that depended on more resilient rangeland systems.

Land Subsidence Rates and Drivers Across the Globe

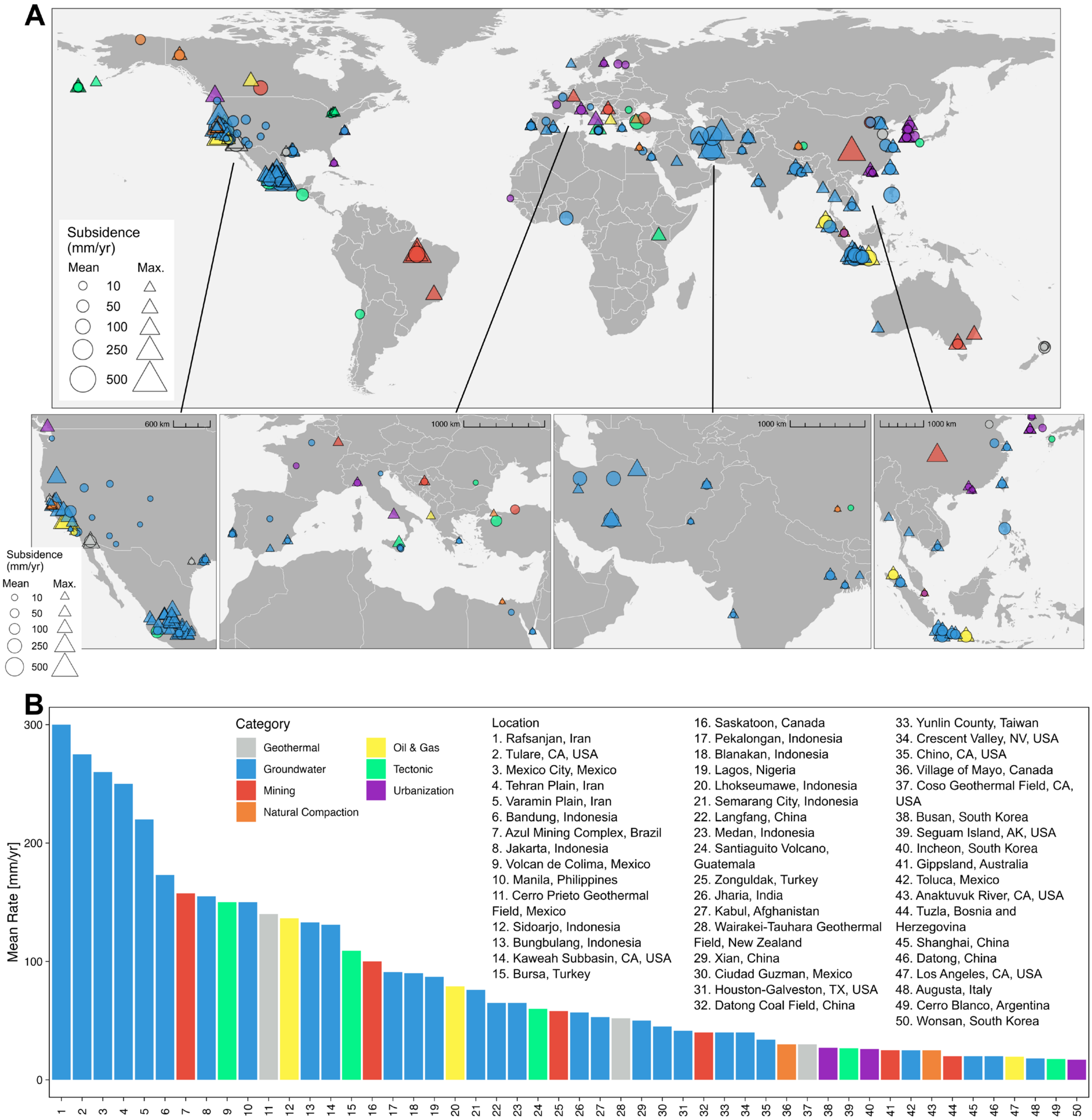


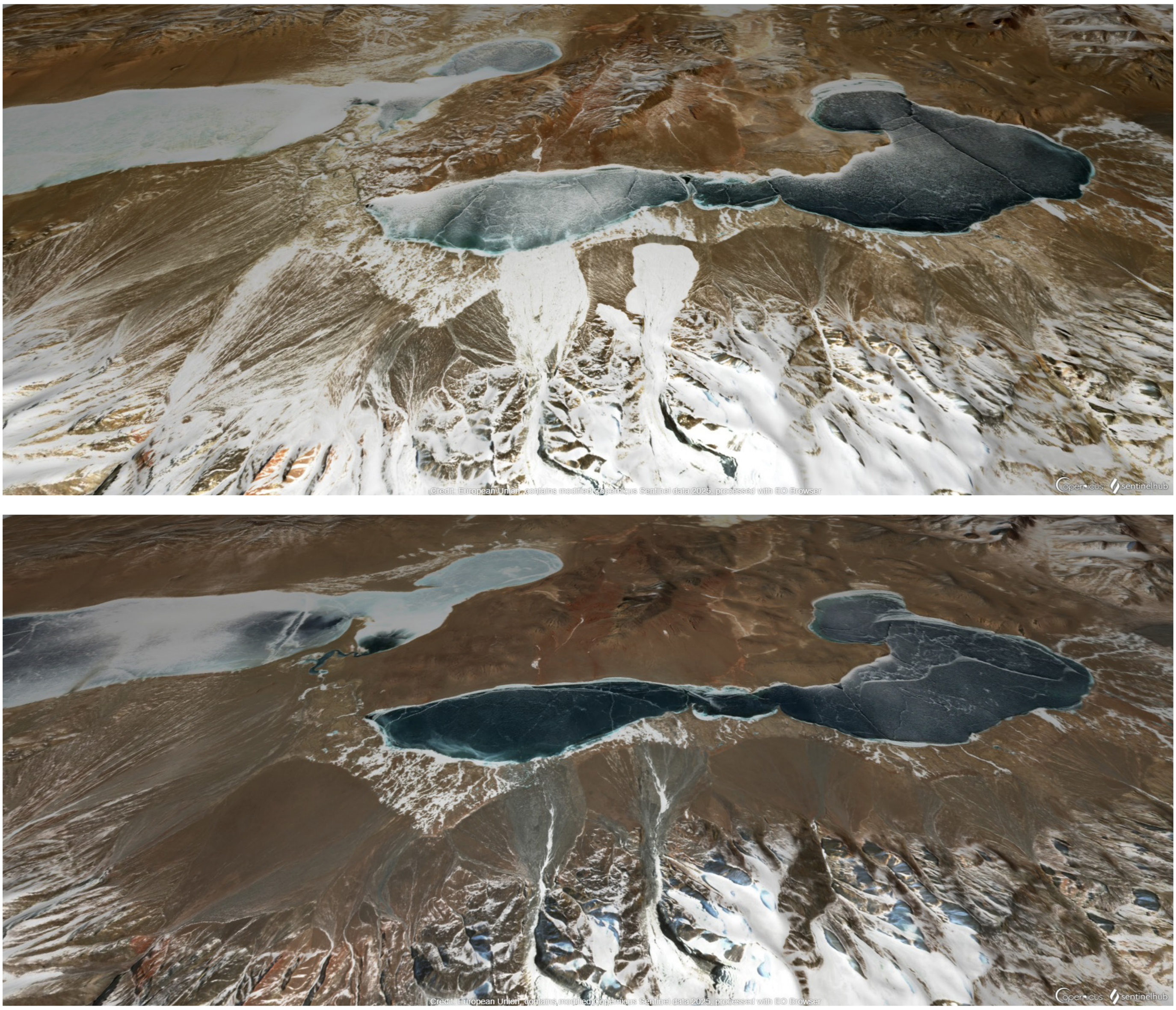
Figure 6. Reported land subsidence rates and drivers across the globe. (A) Global map of main land subsidence drivers (colors) with mean (circles) and maximum (triangles) rates (shape sizes). (B) The primary causes of land subsidence rates at each location. Image source: Huning et al. (2024), Reviews of Geophysics.

2.4 Cryosphere Loss

Cryospheric decline compounds the existing pressures on water resources. **The world, in multiple locations, has already lost over 30% of its glacier mass** since 1970, and several low-latitude mountain ranges risk losing functional glaciers entirely within decades, eliminating long-standing natural savings accounts that once buffered seasonal water shortages[1,28,29]. Snowpack and permafrost degradation add further uncertainty to water availability and storage in high-latitude and high-altitude systems. In glacier-fed basins across Asia, the Andes, and other mountain regions, communities are already experiencing a transition from "peak water"— a period of temporarily increased melt and runoff—to declining flows, with implications for hydropower, irrigation, and ecological integrity.

Mountain glaciers and seasonal snowpacks function as the "water towers of the world," storing cool-season precipitation and releasing it as meltwater during dry and warm periods. The downstream water supply for around 1.5–2 billion people is at least partly dependent on these high mountain water towers, particularly in basins such as the Indus, Ganges–Brahmaputra, Amu Darya, Yangtze, Yellow, and several Andean rivers[30,31]. As warming progresses, many of these systems first experience a peak water, followed by a long-term decline in dry-season flows once glacier volume is substantially reduced. For irrigated agriculture and hydropower in already stressed basins, this means that historical assumptions about reliable late-summer water supplies are no longer valid. This creates **major operational and water allocation challenges as the existing infrastructure and institutions have been designed to fit the historical conditions that no longer exist.**

Cryosphere loss also alters the frequency and character of extreme events. In deglaciating mountain regions, the formation and growth of glacial lake

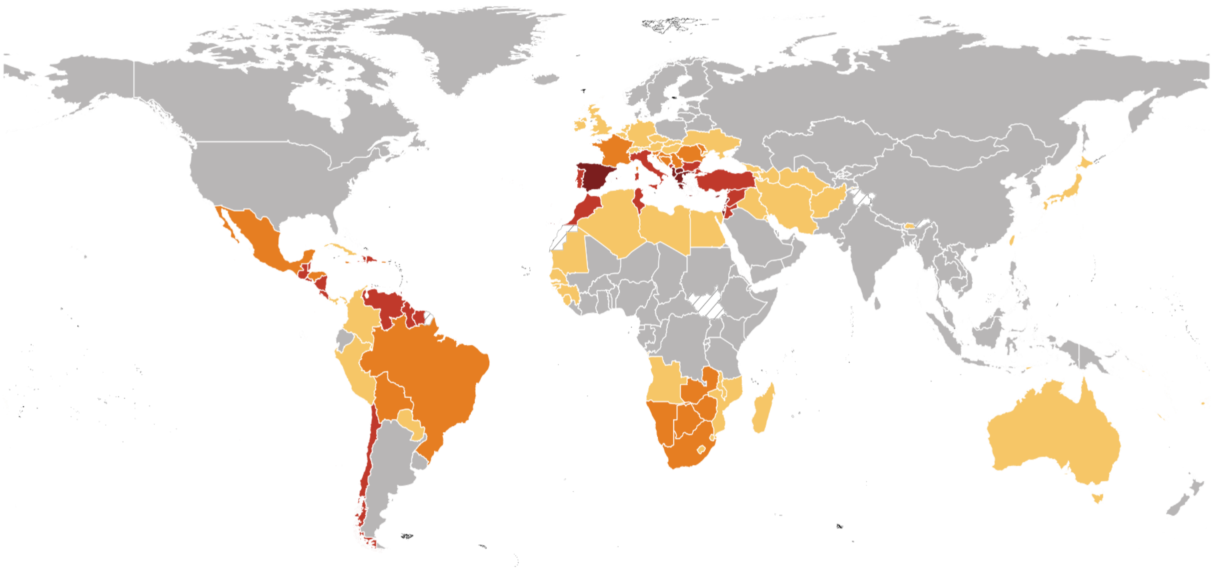


Paired satellite images (from Sentinel-2 true-color) showing the disappearance of glaciers in the Aru Range, Western Tibetan Plateau, China, between 2017 (top) and 2025 (bottom), primarily driven by climate change and warmer temperatures.

outburst floods, which can produce destructive flash floods downstream impacting human settlements, assets, and infrastructure. At the same time, reduced snow cover and permafrost degradation can destabilize slopes, increasing landslide risk and sediment loads in rivers[29,30]. These evolving hazards complicate flood management, infrastructure planning, and disaster risk reduction, particularly where dams, roads, and settlements were designed for historical cryospheric conditions.

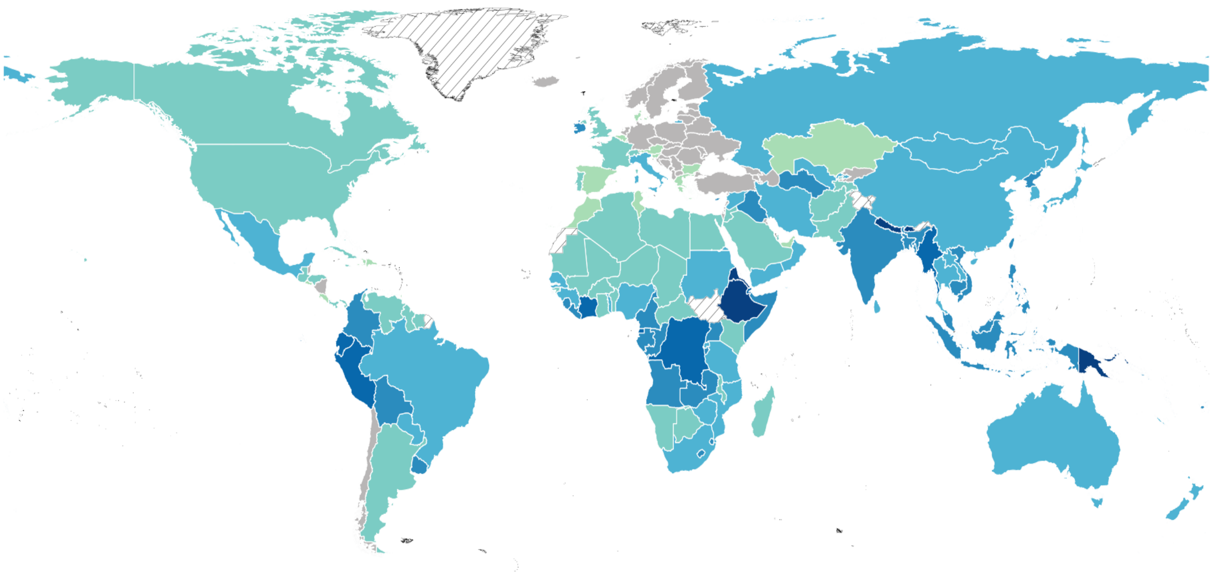
The cryosphere represents a form of underappreciated but **essential natural capital that is being irreversibly liquidated.** Once glaciers have lost most of their mass and seasonal snowpacks have shrunk or shifted upslope, there is no realistic pathway to restore their buffering function within human time frames. This means that societies downstream of the world's major mountain ranges must rapidly adapt to a future with more variable and, in many cases, lower and more erratic dry-season flows—even if annual average precipitation does not decline. The liquidation of this frozen savings account thus interacts with groundwater depletion and surface-water over-allocation to lock many basins into a permanent worsening water deficit state.

Expected Changes in Drought Occurrence Likelihood



No data | No Increase | 50% | 100% | 200% | 350%

Expected Changes in Flood Occurrence Likelihood



No data | No Increase | 50% | 150% | 300% | 600% | 900% | 1300%

Figure 7. Projected changes in the likelihood of future floods and droughts under climate change. Values reflect the increased frequency of future events relative to the historical period (1971–2000) as a percentage. Estimates are based on a multi-model ensemble comparing future conditions (2071–2100) to historical baselines, with projections derived under high-emissions scenarios (RCP8.5 for floods and SSP5–8.5 for droughts). Maps produced based on data provided by Hossein Tabari.

2.5 Threatened Food Systems and Livelihoods

Agriculture accounts for over 70% of global freshwater withdrawals, providing food, employment opportunities, and stable livelihoods to billions of people. But **about 3 billion people and over half of the world's food production are located in regions that are already experiencing, or are projected to face, declining trends in total water storage**—including surface water, soil moisture, snow, ice, and groundwater—driven largely by groundwater depletion and irrigation[32]. Around 1.2 billion people already live in agricultural areas facing severe water constraints, and over 170 million hectares of irrigated cropland, roughly the combined land area of France, Spain, Germany, and Italy, are under high or very high water stress[26].

These conditions translate directly into food insecurity as well as employment and income shocks. In many low- and middle-income countries, agriculture still accounts for 25–60% of total employment; when water shortages reduce yields or force fallowing, wage laborers and smallholders lose their primary source of income, often without social protection[26,33]. Droughts and irrigation shortfalls reduce harvests and disrupt livestock systems, increasing food prices in local and global markets, with the poorest households spending the largest share of their income on food[33–35].

In parallel, deteriorating water quality is eroding the foundations of food systems. Farmers in many basins increasingly rely on marginal-quality water—saline groundwater, polluted rivers or untreated and poorly treated wastewater—to sustain production, especially near growing cities[16,36]. While such practices can provide short-term relief, they often lead to soil salinization, contamination of crops with pathogens and chemical residues, and longer-term productivity losses, with disproportionate impacts on smallholders and peri-urban farmers. For consumers, degraded water quality translates into heightened food safety risks and potential health costs, further illustrating how the degradation of water capital is transmitted through food systems and labor markets.

As drying basins struggle to maintain historical production levels, the resulting food insecurity and livelihood losses contribute to distress migration and displacement. As a result, **drought and water scarcity are now implicated in a growing share of internal displacement events** and are an important driver of projected internal water and climate-related migrations in regions such as sub-Saharan Africa, South Asia, and Latin America[33,37–39]. This shows that the changing dynamics of the biophysical system of the world due to the degradation of its freshwater resources are pushing many societies into a socio-economic failure mode that threatens human security and has major local and global implications for the labor markets, food systems, and demographic patterns.

Share of Agriculture from Total Water Withdrawals

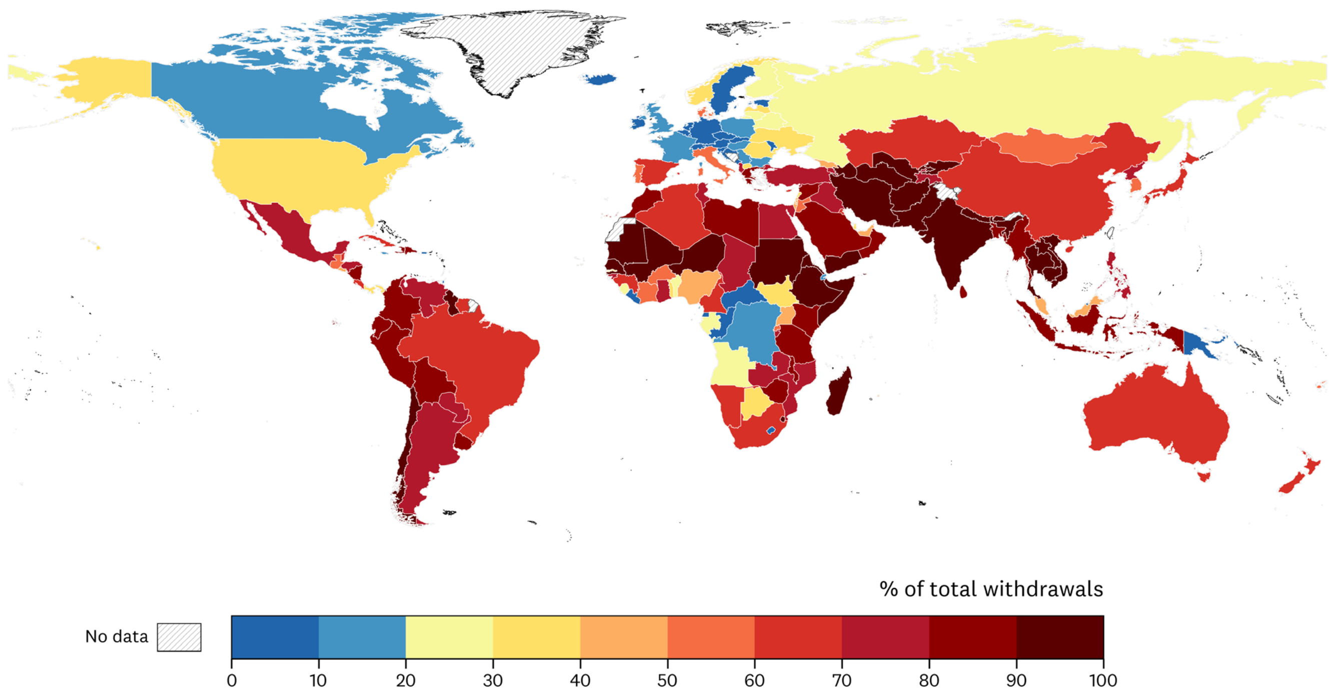


Figure 8. Agricultural water withdrawals as a share of total water withdrawals. The map shows the proportion of water withdrawn by each country for agriculture relative to combined agricultural, industrial, and domestic water withdrawals. Map produced based on data from AQUASTAT, FAO.

2.6 Anthropogenic Droughts and Chronic Water Scarcity

Water shortages around the world can no longer be described as seasonal or exceptional. **Around 4 billion people already live with severe water scarcity for at least one month every year**[1,40]. In many regions, water scarcity is increasingly driven by persistent long-term over-extraction and quality degradation rather than only by climatic variability. In many systems, scarcity is therefore defined not only by how much water is available, but by how much of that water meets basic quality standards for human use, food production, and ecosystem health; polluted or saline water may still appear in volumetric accounts, yet functionally it behaves as if it were not there.

Over **1.8 billion people—nearly one in four humans—were living under drought conditions in 2022–2023**[15], with the vast majority of them in low- and middle-income countries. Drought-related damages, intensified by land degradation, groundwater depletion, and climate change rather than by rainfall deficits alone, already **cost over US$307 billion per year worldwide**[41], more than the yearly economic output of four-fifths of UN Member States. These losses are likely underestimates, as they rarely capture indirect impacts on health, energy, migration, or social stability.

Across many river basins, water shortage conditions are increasingly shaped not by meteorological anomalies but by cumulative human impacts—declining soil water, deforestation, disrupted evapotranspiration cycles, intensive irrigation, and shrinking surface water bodies—producing the chronic water deficits described as **"anthropogenic droughts"**[42]. In regions such as the Mediterranean, the Middle East, South Asia, the Horn of Africa, and western North America, these human-driven processes now exceed natural variability in determining drought severity and duration, with multiple assessments showing that anthropogenic factors dominate the observed intensification of droughts in these areas[29,30,43–46].

Anthropogenic droughts also interact with other hazards and climate extremes to create compound risks. Prolonged dryness and heat reduce soil and vegetation moisture, increasing the likelihood and intensity of wildfires, while at the same time degraded, desiccated soils are more prone to sudden runoff and flash floods when intense rainfall events occur[33,35,41]. These compound extremes—megadroughts followed by fires and flash floods—are increasingly observed in drying regions and are difficult to manage within traditional crisis-response frameworks that assume hazards occur one at a time and within a stable baseline.

Overall Water Risk Across the Globe

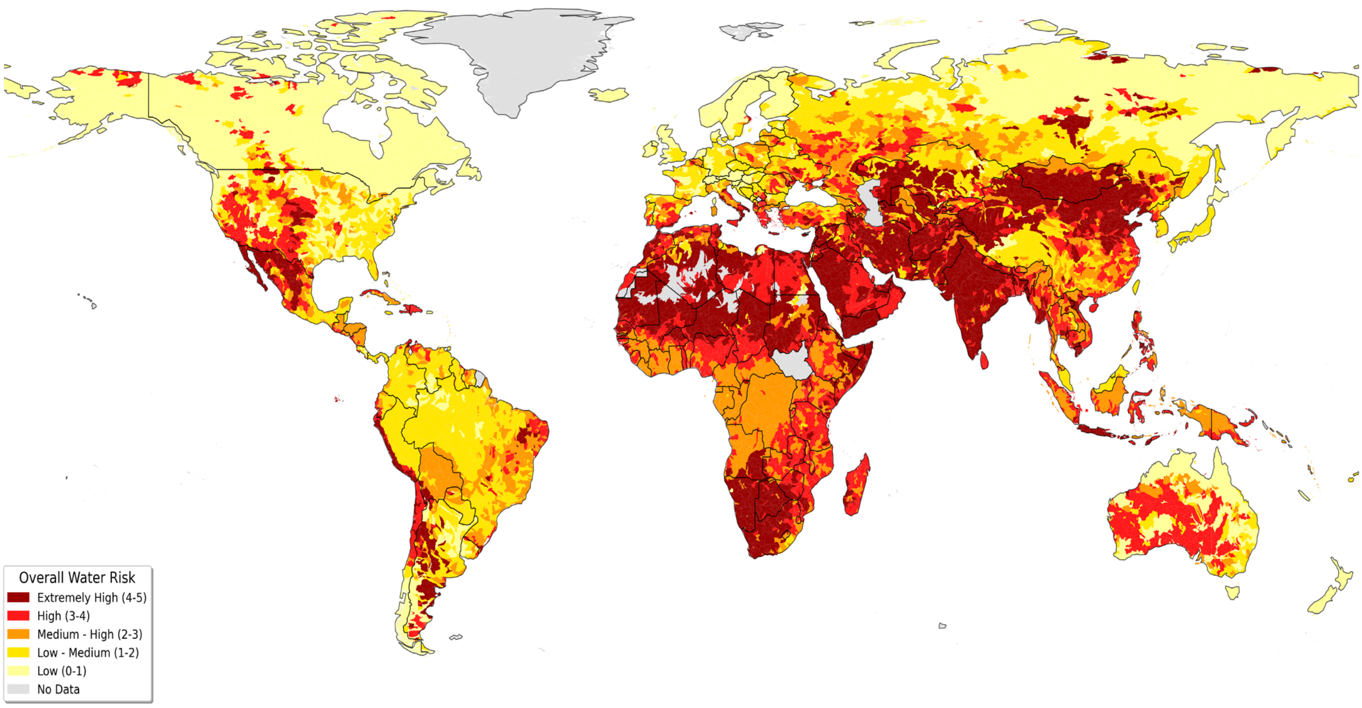


Figure 9. Overall water risk across different regions around the world. The overall risk score reflects the aggregate value of physical water quantity, water quality, and regulatory and reputational risks, with higher values indicating greater water-related risks. Map produced based on Aqueduct 4.0 data.

Paired satellite images (Sentinel-2 L2A true-color) from June 2018 (left) and June 2019 (right), showing the drastic drop in water storage levels in Pulhal Lake (also referred to as Puzhal lake or Red Hills Lake), one of the two rainfed reservoirs, supplying water to Chennai City, one of India's largest cities. On 19 June 2019, Chennai City officials declared that "Day Zero" had been reached as the main reservoirs supplying water to the city had run due to unusual dry conditions following two years of deficient monsoon rainfall.

Day Zero crises in cities represent the urban face of the world's new water reality[47]. The term "Day Zero" has been used to describe moments when municipal systems are on the verge of being unable to supply piped water to most residents, as seen in widely publicized emergencies in cities such as Cape Town, Chennai, São Paulo, Tehran, and others[47–49]. In each case, headline-grabbing shortages were triggered by drought, but made possible by years of over-allocation, unchecked demand growth, and delayed investment in diversified water sources. Emergency measures—severe restrictions, tariff changes, rapid drilling of new wells, reliance on tanker supplies, and behavioral campaigns—helped some cities narrowly avoid a complete shutdown of taps. Yet in many of these places, the underlying aquifers, reservoirs and catchments remain degraded, and poorer neighborhoods continue to live with intermittent service, tanker dependence, and high water costs long after the media attention has moved on.

From a water management perspective, Day Zero must not be treated as a one-off crisis to be "survived", but a symptom that urban systems are already operating beyond their hydrological carrying capacity. The fact that a formal shutdown of the network is narrowly averted does not mean the system has rebounded; it often means that hidden forms of rationing, informal coping mechanisms, and unequal access have become the new normal. Urban Day Zero events therefore sit on the same continuum as collapsing aquifers, drying rivers and failing rainfed agriculture: all are manifestations of human–water systems that in addition to reaching insolvency, can no longer return to their previous state and must be reorganized under permanently tighter constraints.

Low water levels of Lake Mead near Las Vegas in February 2022. Lake Mead is the largest reservoir of the United States in terms of capacity, formed by the Hoover Dam on the Colorado River, providing water to the states of Arizona, California, and Nevada, as well as Mexico. In response to the declining water levels under drought, "Tier Zero" mandatory water delivery reductions were implemented for Arizona, Nevada, and Mexico in 2020 to prevent the reservoir from falling to even more critical levels, followed by the first-ever Tier 1 water shortage declaration in 2021. Nonetheless, in July 2022, Lake Mead reached its lowest historical water level since the 1930s, when the Hoover Dam was constructed. Photo: Christopher Clark, USBR

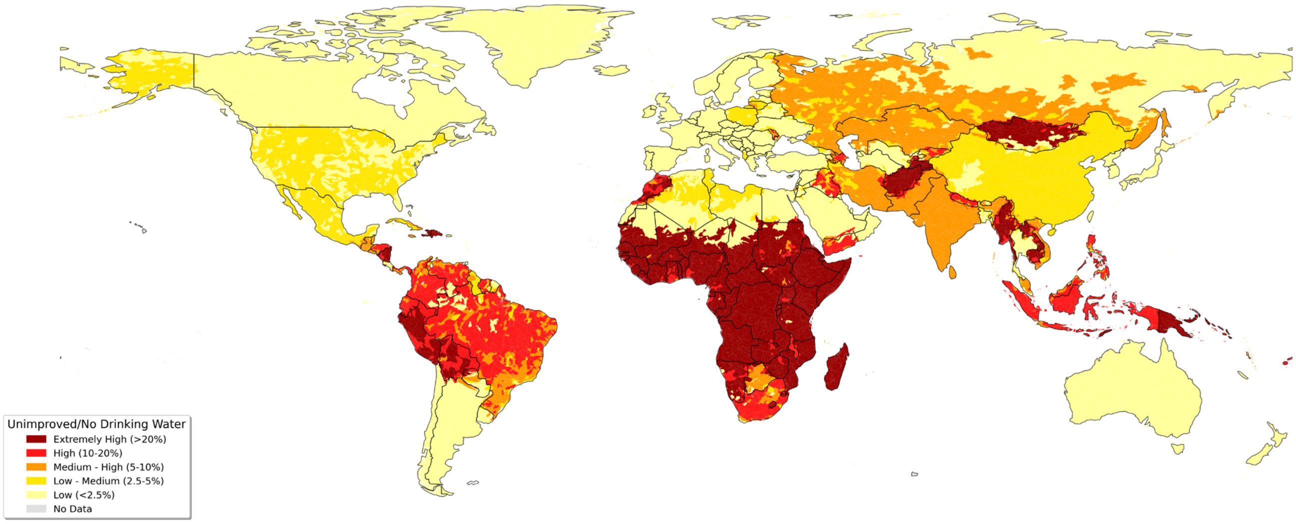
2.7 Degrading Water Quality and Shrinking Usable Supply

Increasing scarcity of water is not only a story of declining volumes. It is equally a story of water that is physically present but no longer fit for purpose. Globally, **a large share of municipal and industrial wastewater is still released to the environment untreated or only partially treated**, while diffuse pollution from agriculture—nutrients, pesticides, pathogens and sediments—degrades rivers, lakes, reservoirs and coastal waters[9,16,36] .

In many rapidly urbanizing basins, downstream communities face a hydrological paradox: river flows may be sufficient in purely volumetric terms, yet much of that water cannot be used safely for drinking, irrigation, or recreation without costly treatment and poses serious risks to human and ecosystem health. Groundwater systems face similar pressures. Nitrate contamination from fertilizers and livestock, industrial pollutants, and naturally occurring arsenic and fluoride mobilized by deeper pumping have rendered some aquifers unsafe for drinking water, even before accounting for depletion[16,22]. Saltwater intrusion into coastal aquifers, driven by over-abstraction and sea-level rise, can permanently compromise groundwater quality and force expensive alternative supply options or relocation of users.

These dynamics mean that the effective, usable balance sheet of water is shrinking faster than simple volume statistics suggest. Any realistic diagnosis of water scarcity must therefore integrate both quantity and quality, recognizing that degraded water quality reduces the real carrying capacity of human–water systems and can be as bad as physical depletion.

Lack of Access to Safe Drinking Water Supplies



Lack of Access to Improved Sanitation Services

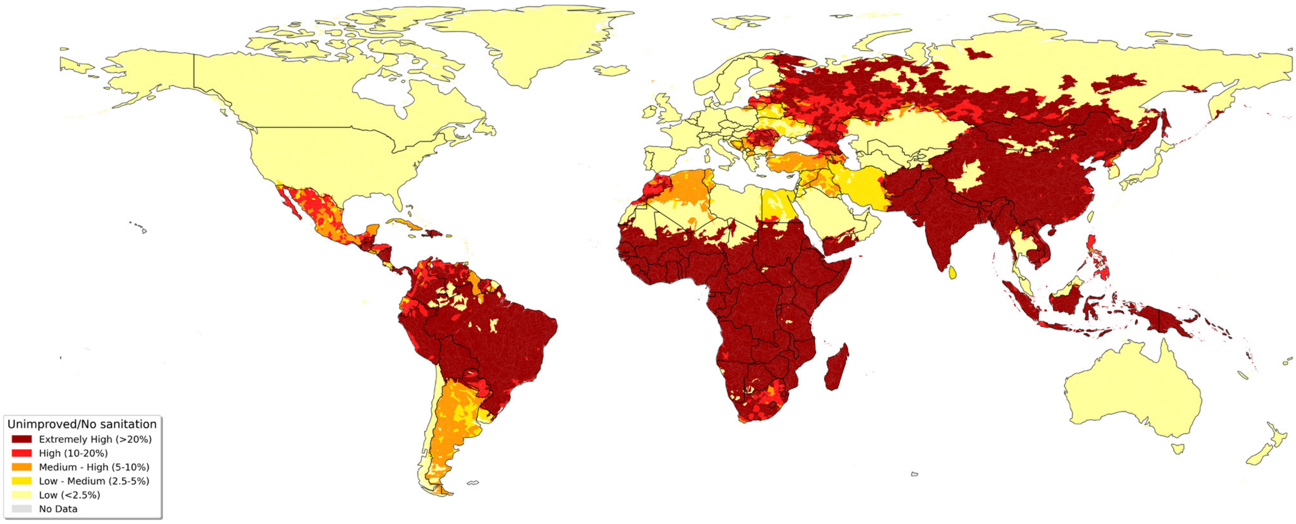
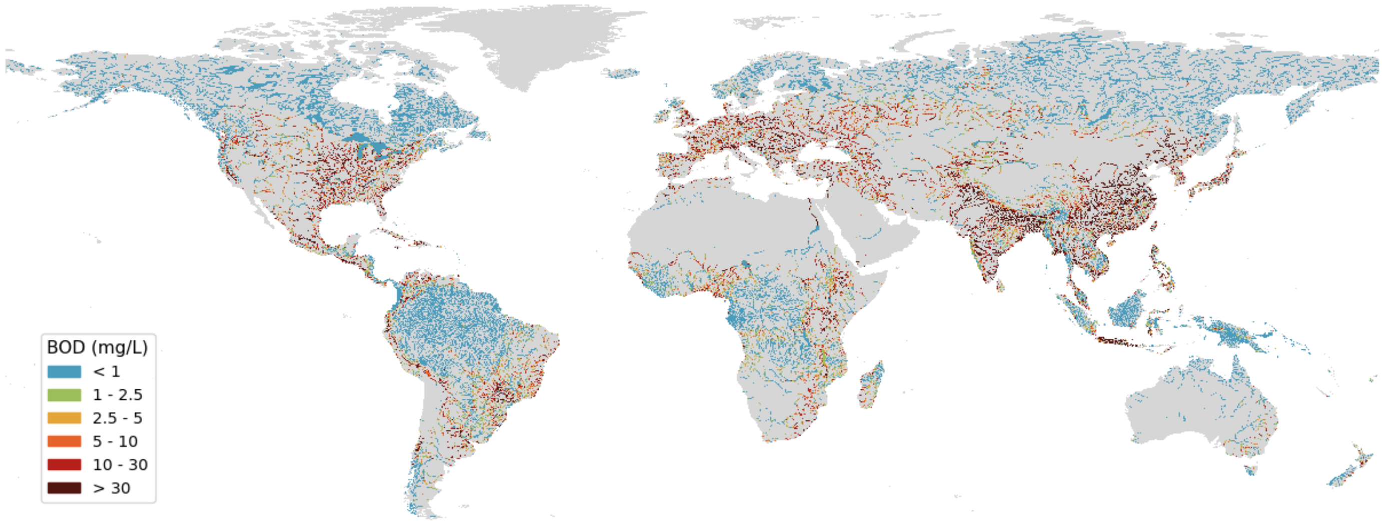
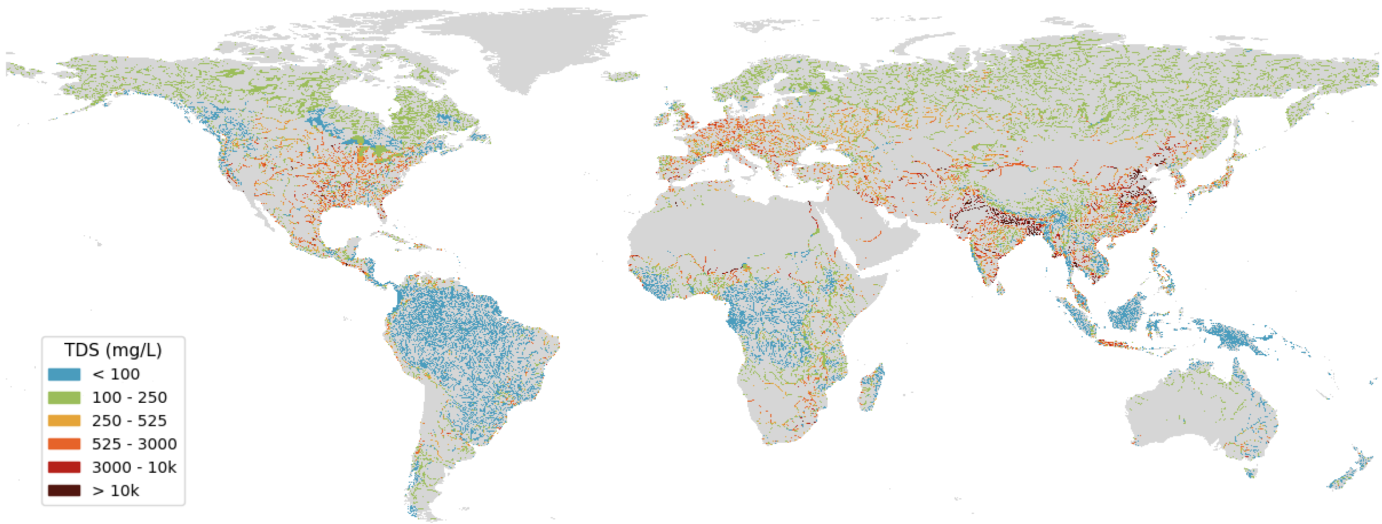


Figure 10. State of access to safe drinking water and improved sanitation services around the world. The top map shows the percentage of the population with no access to safe drinking water supplies, collecting drinking water from unprotected and unsafe sources. The map on the bottom shows the percentage of population without access to improved sanitation services, including those who directly dispose human waste in open bodies of water, beaches, forests, and other open spaces. Maps produced based on Aqueduct 4.0 data.

Organic Pollution: Average Biological Oxygen Demand (BOD) Concentrations



Salinity Pollution: Average Total Dissolved Solids (TDS) Concentrations



Pathogen Pollution: Average Fecal Coliform (FC) Concentrations

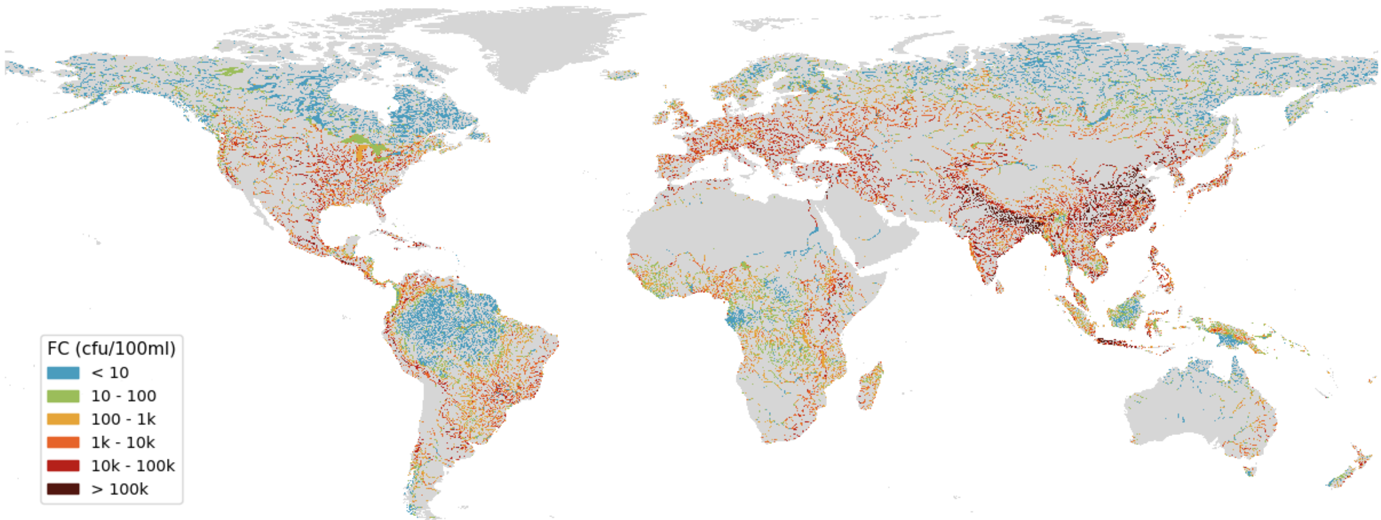


Figure 11. State of surface water quality across the world. The top map shows annual average Biochemical Oxygen Demand (BOD) concentrations for the 2010–2019 period, indicative of organic pollution levels; high BOD means more organic pollution, depleting vital dissolved oxygen for aquatic life, potentially harming ecosystems. The middle map illustrates Total Dissolved Solids (TDS) concentrations for the 2010–2019 period, indicative of salinity levels and dissolved minerals; high TDS means more dissolved substances and pollution, potentially impacting water quality and utility. The bottom map displays Fecal Coliform (FC) concentrations for the 2010–2019 period, indicative of fecal contamination from human or animal waste; high FC counts mean a greater likelihood of harmful pathogens, increasing the risk of waterborne diseases. Maps produced based on data from Jones et al. (2023), Geoscientific Model Development.

2.8 Planetary Boundaries, Tipping Points, and Irreversibility

Taken together, these trends point to a structural transformation of the global water cycle that goes beyond crisis. **Humanity has already pushed the freshwater cycle beyond its safe operating space.** The global freshwater boundary has been transgressed, alongside boundaries for climate, biosphere integrity, and land systems[6]. This means that the Earth system in the Anthropocene is operating outside the range of variability that supported the relatively stable Holocene conditions under which human societies developed.

Crucially, many of the **damages are irreversible or effectively irreversible on human time scales**. Compacted aquifers do not rebound, subsided deltas do not rise, extinct species do not return, and lost glaciers and wetlands cannot be restored within planning horizons. Even where partial restoration is technically possible, the costs are often prohibitive, and the climate and socioeconomic conditions that supported past states no longer exist.

The available evidence and observations around the world thus support **a diagnosis that goes beyond simply a "global water crisis"**. In many basins, aquifers, and ecosystems, the combination of chronic overdraft, ecological degradation, and surpassed tipping points signals a transition to **water bankruptcy**[5]: a persistent post-crisis condition in which long-term water use has exceeded renewable inflows and safe depletion limits, and in which the old normal can no longer be recovered. This water reality of the Anthropocene is the foundation for the transformative institutional frameworks and the agenda that the world needs to urgently develop to address its water bankruptcy.

The Secretariat building at the United Nations Headquarters in New York, U.S.A., in haze on 7 June 2023 due to smoke from Canadian wildfires during unusual and in some places, unprecedented dry conditions, across Quebec and Ontario. Photo: UN, Loey Felipe

CHAPTER 3

WATER BANKRUPTCY IN THE ANTHROPOCENE

Pego do Altar reservoir riverbed exposed in October 2017, Santa Susana, Portugal. During severe droughts in 2017 and 2022, Portugal's Pego do Altar reservoir saw its riverbed and structures like an 18th-century bridge emerge from the shrinking waters, revealing cracked earth, dead fish, and stark reminders of water realities in the Anthropocene, with similar scenes of submerged villages (like Aceredo) appearing in Spanish reservoirs. Photo: Jules Verne Times Two, julesvernex2, Wikimedia Commons

3.1 A New Term for a New Discourse

The language we use to describe water problems shapes how societies respond to them. For decades, **"water stress"** and **"water crisis"** have been the dominant frames of discourse. They have helped mobilize attention and resources, but they now obscure a fundamental shift in the condition of many human–water systems. These terms are no longer adequate to spark proper responses as they cannot explain what is happening today in human-water systems.

"Water stress" typically denotes a high ratio of water withdrawals to renewable supply. It suggests a system under pressure, but not necessarily one that has failed. "Water crisis" goes further: it describes an acute, time-bounded disruption, often triggered by a shock such as drought, flood, contamination, infrastructure failure, or conflict. Both concepts implicitly assume that there is a viable baseline state to which the system can return once the stress is alleviated or the crisis is managed.

In much of the world, however, the baseline itself has collapsed. Long-term over-extraction of water, land and ecosystem degradation, cryosphere loss, and climate change have together pushed many systems beyond their hydrological carrying capacity and damaged the natural capital that underpinned resilience. In these places:

a. "stress" and "crisis" no longer capture the reality in which the damage is systemic, not temporary;

b. irreversible or effectively irreversible changes have occurred;

c. restoring the old normal is infeasible, even with large investments; and

d. mitigation attempts with the ambition of "returning to normal" often deepen the losses.

Using the terms "water stress" or "water crisis" to refer to the new water realities can further contribute to a collective denial that mitigation efforts are not going to be effective as the baselines we want to go back to are not even there anymore[5,7].

"Water bankruptcy" is the term to refer to this new reality[5], not for rhetorical escalation, but for diagnostic clarity. Using it must spark new discourse on a post-crisis state in which human–water systems have overspent their water capital and crossed critical tipping points. **These systems must now be governed on fundamentally different terms**.

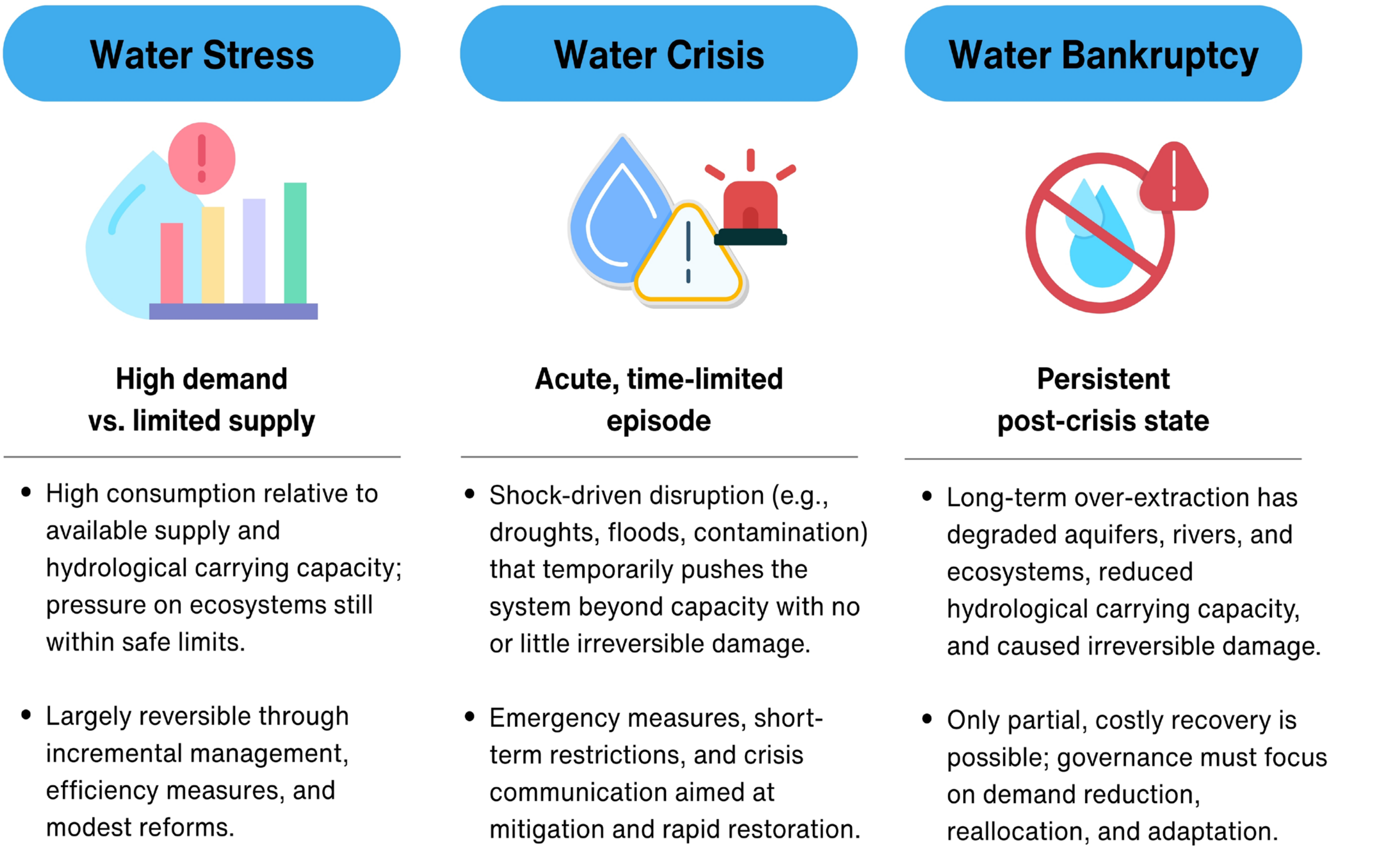


Figure 12. Three states of concern in human-water systems. The figure illustrates the major distinctions between water stress, water crisis, and water bankruptcy. These states reflect different levels of pressure on water resources and the underlying natural capital, requiring different responses by governments and stakeholders. Misidentifying the real state of the system can result in implementing ineffective or even wrong solutions. Figure adapted from Madani[5].

3.2 Conceptual Foundations

The water bankruptcy concept rests on a simple but powerful analogy between hydrology and finance[50–53]. In financial systems, bankruptcy is not declared because someone experiences a temporary cash-flow problem; it is declared when an entity has spent beyond its means for so long, and accumulated such unsustainable debts, that it can no longer meet its obligations and the balance sheet itself must be reset.

Applied to water, this analogy emphasizes three ideas[5]:

First, **water is a form of natural capita**l, not just a flow. Human–water systems draw on both annual "income" and long-term "savings". Renewable water—rivers, lakes, reservoirs, renewable groundwater, soil moisture, snow—functions like a checking account. Non-renewable or very slowly renewable stocks—deep groundwater, long-residence aquifers, glaciers, some wetlands and peatlands—function like a savings account. Healthy ecosystems and soils, which regulate storage and flows, are also part of this capital. This capital is degraded not only by over-abstraction and land-use change, but also by pollution and salinization, which can effectively "freeze" parts of the checking and savings accounts by making them unsafe or uneconomic to use for their intended purposes.

Second, **claims on this capital take the form of entitlements and expectations**: legal water rights, customary claims, informal expectations, allocation rules, infrastructure designed around certain yield assumptions, and social promises about food, energy, urban and industrial supply, or environmental flows. Over time, these claims can grow faster than the underlying hydrological capital, especially when subsidies, political incentives, and short-term development goals encourage expansion of irrigated agriculture, urban sprawl, or water-intensive industries without regard to ecological limits.

Third, **when withdrawals and expectations persistently exceed inflows and safe depletion limits, the system accumulates ecological and social debt**. Aquifers are mined, wetlands and rivers are degraded, soils are salinized, species are lost, deltas subside, and the capacity of land and ecosystems to store and regulate water is eroded. At the same time, unmet or conflicting claims produce social and political tensions that cannot be resolved simply by building more infrastructure or reallocating small volumes of water.

In this perspective, water bankruptcy is not about the severity of a single drought or the level of stress in a particular year. It is about the balance sheet of a human–water system: its stocks and flows, its claims and obligations, and its ability to service those obligations without liquidating the natural capital on which its future depends.

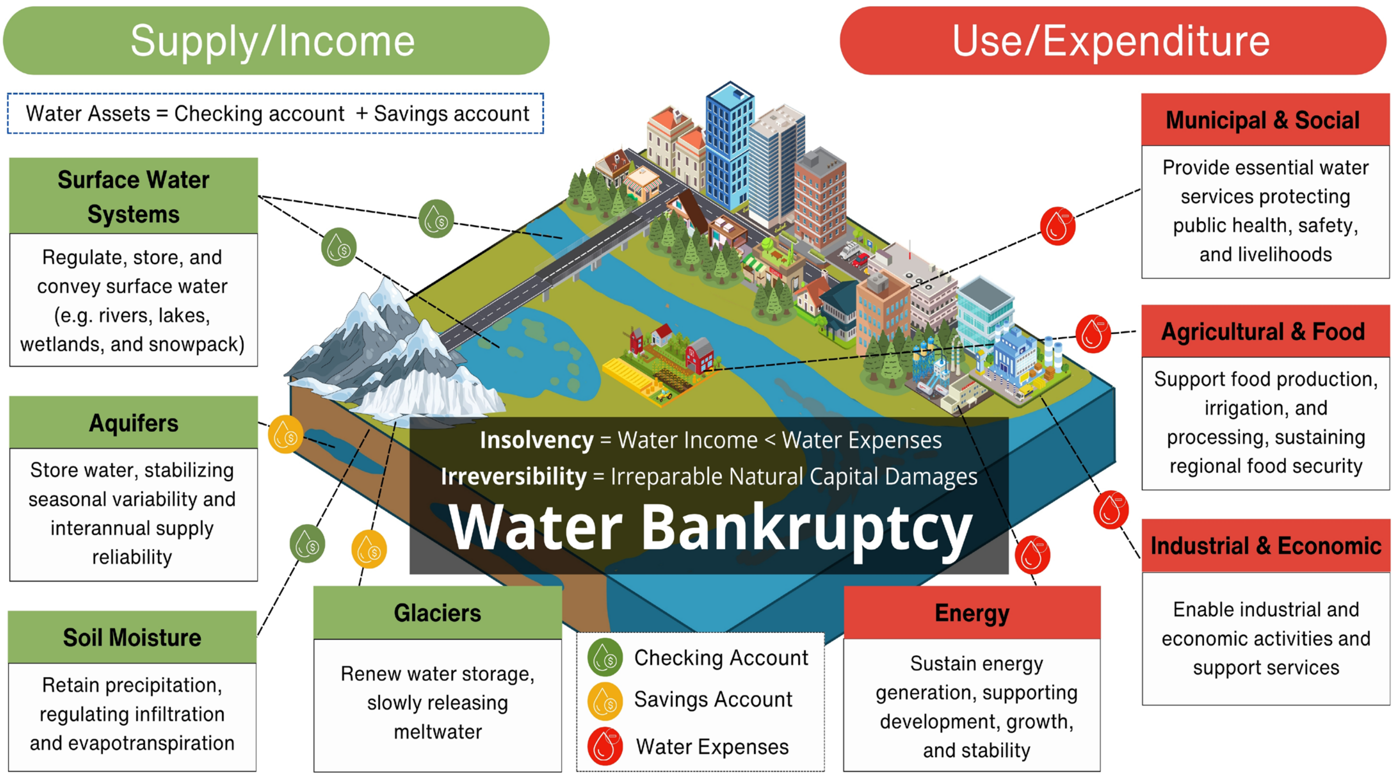


Figure 13. Water income, assets, and expenses in human-water systems. Water bankruptcy is the outcome of both insolvency and irreversibility conditions, i.e., when water use (expenditure) exceeds water supply (renewable and non-renewable assets) for an extended period resulting in irreparable damages to the underlying natural capital that contributes to water production and stability of the hydrological cycle.

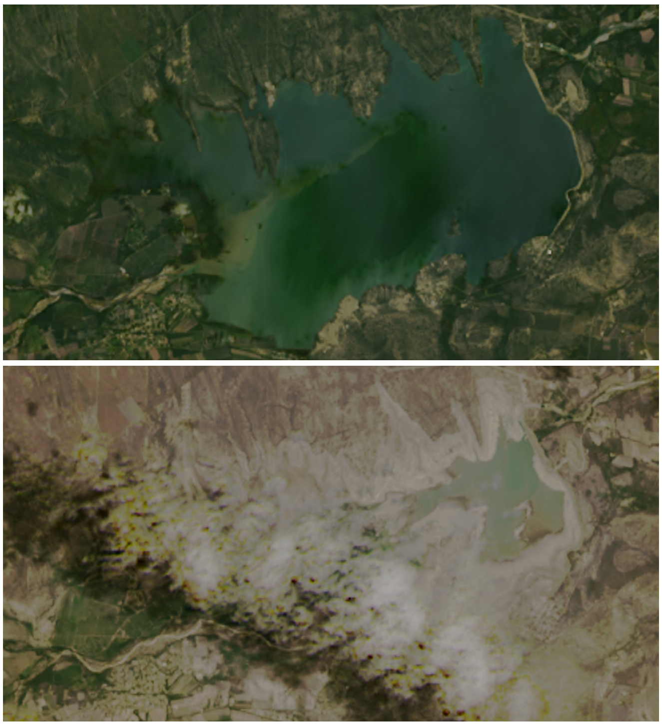
3.3 From Anthropogenic Drought to Water Bankruptcy

"Anthropogenic drought" has been proposed as a concept **to distinguish between water shortages driven primarily by natural variability and those driven largely by the combination of natural causes and human actions**[42].

Anthropogenic drought is understood as a long-term process whereby land-use change, water over-allocation, groundwater depletion, climate change, and other human-induced changes in the human-water system turn what might have been manageable dry periods into persistent water deficits, even under "normal" climate conditions[42].

Water bankruptcy can be seen as the outcome or end-state of this process when it continues unchecked[42]. Where anthropogenic drought describes a **"process"** of drying and deficit amplified by humans, water bankruptcy describes the **"state"** of the human-water system after critical thresholds have been crossed: when long-term water use has exceeded renewable inflows and safe depletion limits for so long that the underlying water and natural capital is degraded beyond easy repair[5].

In this sense, anthropogenic drought and water bankruptcy are complementary concepts to better describe and understand human-water systems in the Anthropocene. Anthropogenic drought is the **pathway**; Water bankruptcy is the **destination** at which mitigation alone is no longer sufficient, because part of the damage is irreversible and the system cannot be brought back to its previous condition with practical economic and political costs within meaningful planning horizons. Such a situation calls for **adaptation** to new normals in addition to **mitigation** efforts that seek to prevent further damages and restore what can be restored[5,7].



Paired satellite images (Landsat 8–9 L2) of the Cerro Prieto reservoir, Mexico, from 2015 (top) and 2022 (bottom). Monterrey, the capital of Nuevo León and Mexico's second-largest metropolitan area, relies on this reservoir for its water supply. In July 2022, during a severe drought, storage levels dropped to 0.5% of capacity.

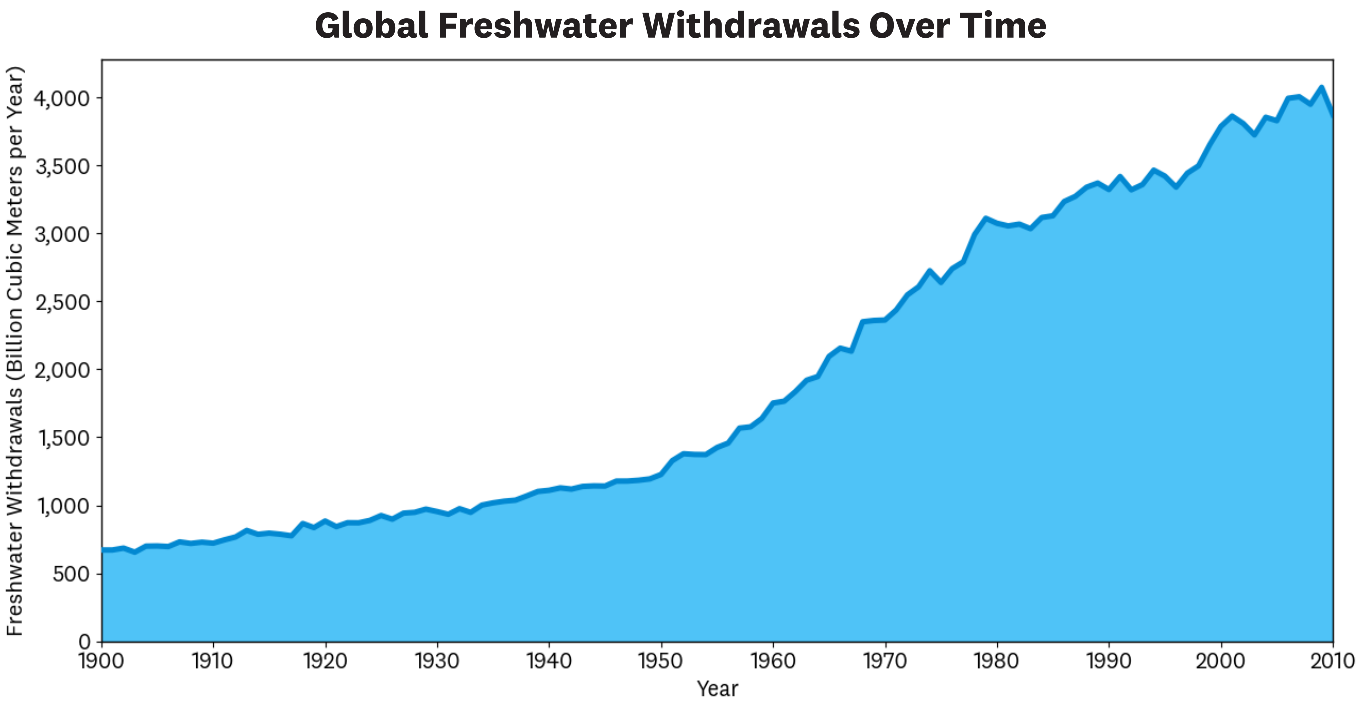


Figure 14. Total global freshwater withdrawals over time. The chart shows significant increase in total freshwater withdrawals for agriculture, industry and domestic uses across the globe during the 1900-2010 period. Increased water withdrawals are normally associated with the reduction of the water share of the environment, with major and often irreparable damages to natural capital. Chart produced using data from Our World in Data.

3.4 A Formal Definition of Water Bankruptcy

Building on this conceptual framing, water bankruptcy in the Anthropocene has been defined[5] as a persistent post-crisis state of a human–water system in which long-term water use and claims on water have exceeded renewable water availability and safe depletion limits of strategic water reserves for an extended period, causing irreversible or effectively irreversible degradation of water-related natural capital and making full restoration of previous system conditions unattainable within relevant human time scales.

Based on this definition, water bankruptcy is not only about **insolvency**—the system's inability to meet the total water demand of its stakeholders—but also about **irreversibility**—the permanent damages that make restoration of the system to its initial conditions infeasible.

The water bankruptcy definition implies several necessary elements:

a. Insolvency and long-term overshoot of hydrological carrying capacity: Average water withdrawals and consumptive use have exceeded renewable inflows and safe depletion thresholds (for example, for groundwater, environmental flows, and soil moisture) for many years or decades.

b. Degradation of natural capital: The stocks and functions that once underpinned resilience—such as aquifer storage, wetlands, riverine ecosystems, snow and ice reserves, healthy soils and vegetation—have been substantially damaged, reducing the system's capacity to buffer variability and shocks.

c. Irreversibility or effective irreversibility: Key components of the system cannot be restored to previous conditions within meaningful policy or planning time frames (for example, due to aquifer compaction, species extinction, glacier disappearance, or prohibitive economic, social, or political costs of restoration).

d. An expectation–reality gap: Existing claims, entitlements, and expectations (for example, legal rights, sectoral allocations, illegal uses, cropping patterns, urban and industrial plans, or environmental flow requirements and commitments) cannot all be met under the new conditions, even if infrastructure, efficiency, and management are improved.

e. A need for transformation and fundamental rebalancing: The system must undergo a reconfiguration of demands, rights, and uses—analogous to a restructuring and fresh start in financial bankruptcy—rather than relying on short-term crisis responses aimed at returning to a previous state.

Under this definition, a system can be highly stressed or frequently in crisis without being water-bankrupt, if the underlying capital and carrying capacity remain intact and recovery to previous conditions is still possible. Conversely, a system can be water-bankrupt even in a relatively wet year, if the damage and overshoot accumulated over previous decades make it impossible to revive the old balance of uses and ecosystem functions.

FORMAL DEFINITION OF WATER BANKRUPTCY[5]

"Water bankruptcy is the persistent post-crisis condition or the state of failure in a human-water system in which:

1. Long-term average human withdrawals from surface and groundwater—the checking and savings accounts of the system—exceed the system's renewable freshwater inflows and the safe limits of depletion of strategic water reserves and pressure on water-dependent ecosystems; and
2. The resulting depletion and degradation of water-related natural capital cause partially irreversible damages on societally relevant time scales, such that historical levels of water supply and ecosystem function cannot be restored without disproportionate social, economic, or environmental costs."

3.5 Distinguishing Water Stress, Water Crisis, and Water Bankruptcy

Water stress, water crisis, and water bankruptcy can be defined as three stages of degradation of a human-water system[5]:

1) **Water stress describes conditions where demand and withdrawals are high relative to available renewable supply**, often expressed as a ratio (for example, withdrawals as a share of renewable resources). Stress can be chronic but does not in itself imply failure; it may be managed through efficiency, recycling and reuse, demand management, and careful allocation so long as the underlying natural capital and hydrological carrying capacity are preserved.

2) **Water crisis describes acute, time-bounded episodes where the system is pushed beyond its operating capacity,** often by a shock such as drought, flood, contamination, conflict, management mistakes, or infrastructure failure. Crisis management focuses on mitigation strategies and emergency responses aimed at limiting damage and restoring the system to its prior condition once the shock has passed.

3) **Water bankruptcy describes a persistent post-crisis state of insolvency and irreversibility** of a system in which long-term overshoot and accumulated damage have degraded the system's natural capital and carrying capacity to the point that not only can the current demand not be met, but also previous conditions of the system cannot be restored. In water-bankrupt systems, traditional crisis management that focuses on short-term mitigation and restoration is no longer an adequate or appropriate strategy, calling for the combination of mitigation efforts to restore the repairable components with adaptation to the new conditions of the system.

Conceptually, water stress can be thought of as **pressure**, water crisis as an **acute disruption**, and water bankruptcy as a **structural failure**. Stress and crisis are warning signs and phases on the way to bankruptcy. Once bankruptcy has occurred, the problem is no longer how to navigate a temporary emergency, but how to redesign and transform the system—its uses, rights, infrastructure, and expectations—to function under new, permanently constrained conditions.

THE THREE STATES OF CONCERN IN HUMAN-WATER SYSTEMS

Water Stress
State of the system when demand and pressure are high relative to available supply, but impacts are still largely reversible through incremental management and modest reforms.

Water Crisis
State of the system when acute, shock-driven disruptions (for example, droughts, floods, contamination events or infrastructure failures) temporarily push it beyond capacity but the problem can, in principle, be resolved through emergency measures and restoration.

Water Bankruptcy
State of the system that has moved beyond both stress and crisis—a post-crisis failure state of the system in which accumulated overuse and degradation have undermined natural buffers and storage to such an extent that simple restoration is no longer feasible.

3.6 Pathways into Water Bankruptcy

Water systems do not become bankrupt overnight. They reach this state through identifiable pathways that combine physical, ecological, institutional, and political dynamics. While each basin and aquifer has its own history[54], several common patterns can be observed:

Slow-onset depletion: Long-term over-allocation of surface water resources and over-pumping of groundwater, often encouraged by subsidies and weak regulation, gradually erode storage and quality. Initial signs—drying wetlands, shrinking rivers, declining water tables, rising pumping costs, subsiding land—are ignored or treated as temporary problems until critical thresholds are crossed.

Infrastructure-driven overshoot: Large-scale dams, diversions, and inter-basin transfers enable expansion of irrigation, cities, and industries beyond sustainable levels. In wet years, the system appears successful; in dry years, deficits reveal that the development model depends on flows that no longer exist.

Ecological liquidation: Wetlands, floodplains, forests, and soils are converted or degraded in ways that increase short-term productive capacity while eroding long-term water storage, filtration, and buffering. Over time, the loss of these functions increases vulnerability to extreme events such as droughts, floods, and contamination.

Climate-amplified overshoot: Climate change acts as a catalyst, accelerating the degradation process. It alters precipitation patterns, snowpack, glacier mass, and evapotranspiration, reducing renewable supply and increasing variability in systems that were already near or beyond their limits. What might have been manageable under historical climate conditions becomes unmanageable once warming and variability are added.

Institutional inertia and denial: Even as evidence of overshoot and damage accumulates, institutions and decision makers remain organized around the assumption that the old normal will return. Water rights, subsidies, investments, and infrastructure development projects continue to reinforce over-use, and politically difficult decisions about demand reduction, reallocation, and adaptation are postponed.

These pathways are not mutually exclusive. In many cases, water bankruptcy emerges from their interaction: for example, an over-allocated river basin underpinned by depleted aquifers and degraded ecosystems, facing a more variable and warmer climate. Recognizing these pathways is essential for shifting from crisis management to bankruptcy management.

Land Subsidence Rates in Coastal Cities

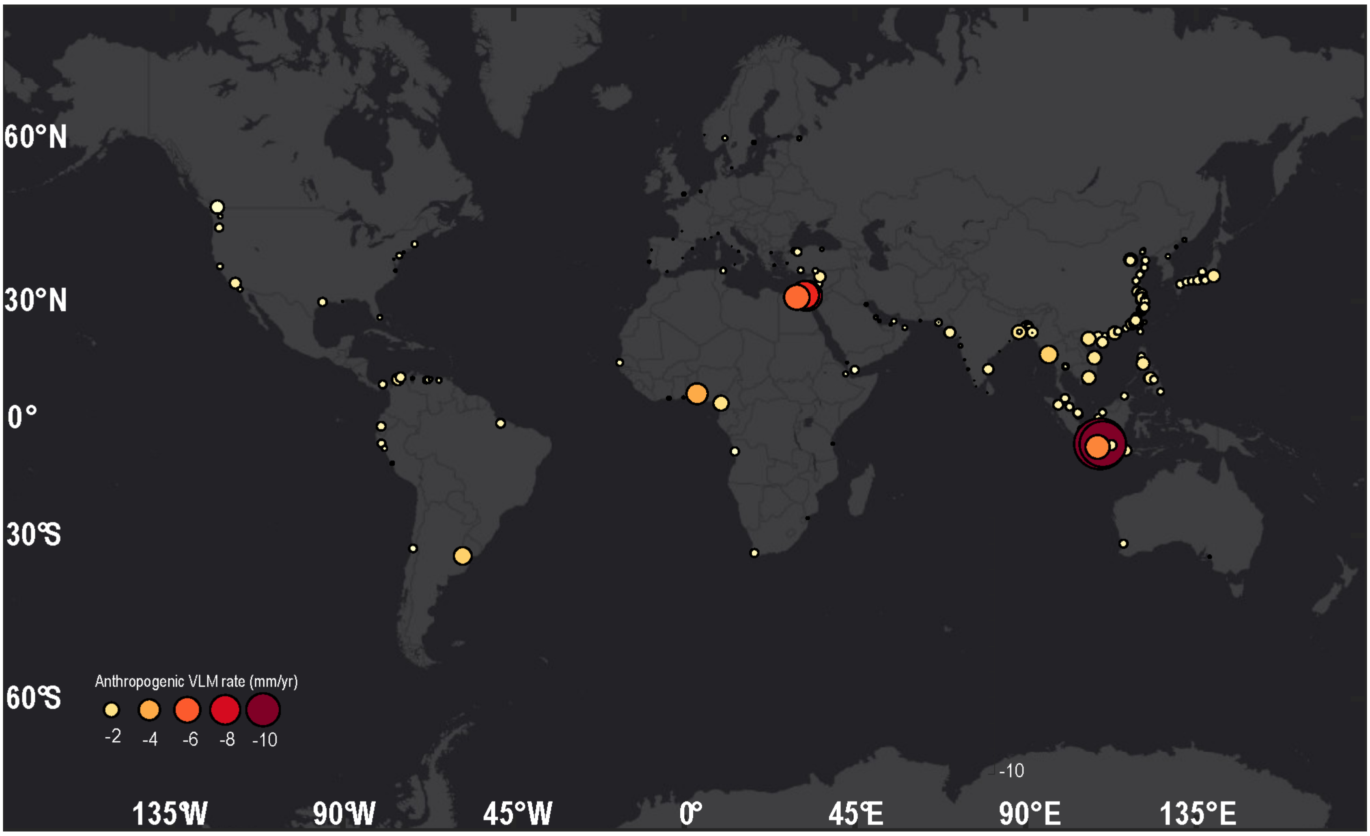


Figure 15. Land subsidence rates in coastal cities of the world. The map shows the rate of anthropogenic vertical land motion (VLM), mainly driven by groundwater extraction, over the 2015-2024 period in 204 coastal cities worldwide (15 cities in North America, 14 in South America, 15 in Africa, 24 in Europe, 134 in Asia, and 2 in Oceania) encompassing 4% of the land area and 15% of the global population. Each city is color-coded by its area-weighted average VLM after removing the effect of tectonic uplift and glacial isostatic adjustment. Map produced by Manoochehr Shirzaei.

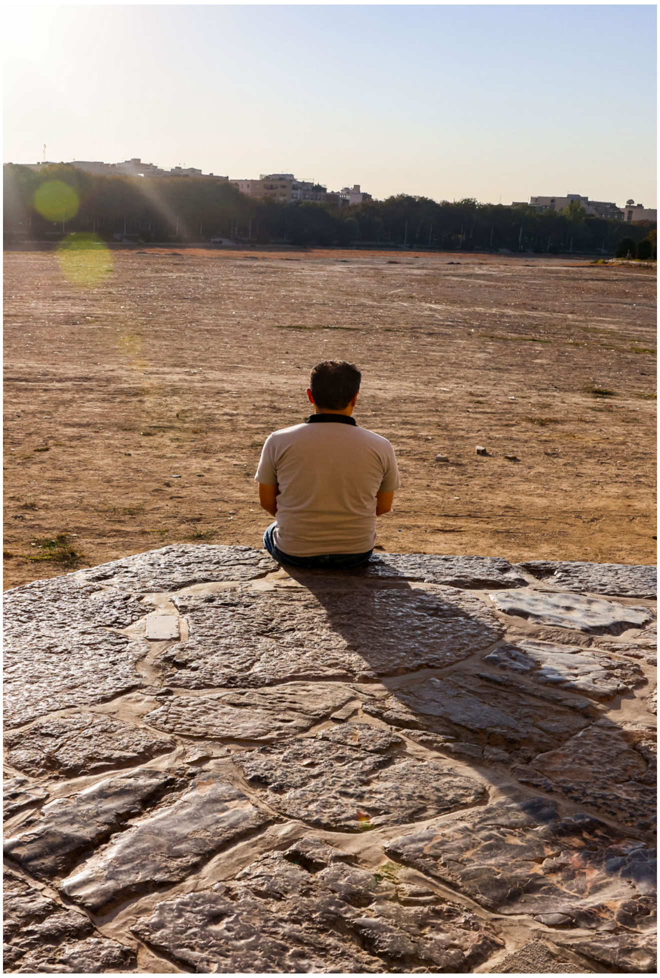
3.7 Implications for Monitoring and Diagnosis

As a distinct state, water bankruptcy requires different approaches to monitoring, diagnosis, and early warning. Traditional indicators, such as annual withdrawal-to-availability ratios, reservoir levels, soil moisture status, or seasonal flow volumes, are not sufficient on their own. Water bankruptcy calls for greater emphasis on:

Stocks and trends, not just annual flows: groundwater storage, lake levels, wetland extent, glacier and snowpack trends, soil moisture, and other components of total water storage.

Condition of water-related natural capital: the health of rivers, wetlands, forests, soils, climate, aquifers, and ecosystems that produce, regulate, and store water, and on which water depends.

Irreversibility markers: evidence of aquifer compaction, land subsidence, loss of perennial flows, wetland disappearance, species extinction, or soil salinization that cannot be reversed at acceptable cost or within relevant time frames.



Sitting by the parched bed of the Zayandeh-Rud River in Isfahan, Iran, a young man looks out over a landscape of water bankruptcy—a chronic problem that multiple inter-basin water transfer projects have failed to resolve. Photo: Seyyed Vahid Hosseini (October 2025)

A land subsidence fissure on the road from Kayali Plateau in Konya, Türkiye, caused by excessive groundwater pumping—a stark marker of irreversibility and a symptom of water bankruptcy. Photo: Fatma Canaslan Comut (June 2025)

Claim–capacity mismatch: assessments of how existing claims, rights, allocations, expectations, and development plans compare with the degraded carrying capacity of the system under current and projected climate conditions.

Pathway indicators: signals of anthropogenic drought, infrastructure-driven overshoot, ecological liquidation, institutional inertia, mismanagement, governance inefficiencies, and other process-related indicators[55–57] that can help with the early detection of emerging water bankruptcy conditions.

Developing such indicators, which should not be limited to quantitative measures, and integrating them into national, basin-level, and global monitoring frameworks is a critical step toward recognizing when human-water systems are approaching bankruptcy and when they have already crossed into a post-crisis state. Without this diagnostic shift, policies will continue to address chronic overshoot and irreversible damage as if they were temporary crises, with predictable and escalating failures.

3.8 Protecting Water as a Natural Capital: Product Versus Process

For centuries, **our laws, policies, and institutions have treated water primarily as a "product"**—measurable good or service to be allocated, traded, and delivered, counted in cubic meters and managed through permits, pipes, and price signals. **Far less attention has been paid to the "processes" that generate that good:** the integrity of the hydrological cycle and the natural capital—soils, wetlands, rivers, aquifers, glaciers, snowpacks, forests, vegetation, oceans, and climate—that produce, capture, store, filter, and redistribute water in time and space[5]. When these "water-producing" systems are drained, polluted, compacted, deforested, warmed, melted, or disrupted, societies may still be able to move some remaining water around, but the underlying capacity of the landscape to produce reliable, good-quality water is eroded. **Efforts to protect a product are ineffective when the processes that produce it are unchecked and allowed to be disrupted**[5].

Water bankruptcy makes this invisible dependence explicit. It reminds us that what is at stake is not only the volume of water available today, but also the resilience of the processes that will generate tomorrow's water. Governing water in the Anthropocene, therefore, requires treating both **water itself (product) and the hydrological cycle and natural capital that produce it (process) as interconnected commons**[5]—assets that must be protected and restored collectively if any allocation, pricing, or efficiency reform is to remain meaningful over time.

WATER BANKRUPTCY AT A GLANCE

A system is water-bankrupt when both the checking and savings accounts have been drawn down beyond safe limits and when parts of the water-related natural capital cannot be restored on human time scales, such as compacted aquifers, subsided deltas, lost wetlands, or extinct species.

Water bankruptcy is a persistent post-crisis condition of a human–water system in which:

Long-term water use exceeds renewable inflows and safe depletion limits. This applies to both checking account (renewable water resources in short-term) and savings (non-renewable water resources in short-term), over extended periods rather than during short-lived shocks.

Overshoot causes major damage to water and water-related natural capital. Aquifers, rivers, lakes, wetlands, soils, glaciers, and freshwater biodiversity are degraded to the point that they lose part of their historical ecosystem functions and make water supplies more limited by disrupting the water production cycle.

The old "normal" can no longer be recovered. The extent of damages is such that the historical state of the system cannot realistically be restored within meaningful policy or planning horizons, i.e., full restoration to old hydrological and ecological conditions is no longer a credible objective, even with substantial investments and favorable climate conditions.

CHAPTER 4

GOVERNING GLOBAL WATER BANKRUPTCY

Adi Jarso, a mother of eight children in Tigray, Ethiopia, says that the past three years have been difficult for the community. They are struggling to save their cattle as severe drought persists. "We get water here. This is our only hope. We pray that the rains will come." At the time this photo was taken (4 October 2022), the community was dealing with a "double catastrophe": the convergence of the worst drought in 40 years and a devastating civil war. Photo: UNICEF Ethiopia, Demissew Bizuwerk

4.1 From Crisis Management to Bankruptcy Management

Recognizing water bankruptcy changes the central question of water governance. The task is no longer to "get through" a crisis and restore a lost normal, but **to govern human–water systems that must live permanently within tighter, degraded, and uncertain hydrological limits.** In such systems, the baseline itself has shifted[5,7]. Aquifers, wetlands, rivers, soils and glaciers have been drawn down or damaged to the point that they can no longer support past levels of use.

In this context, traditional crisis management—focused on short-term mitigation and rapid restoration—is no longer sufficient. **Bankruptcy management** is needed: a deliberate, justice-oriented effort to prevent further irreversible damage, rebalance claims within a reduced carrying capacity, and support societies in adapting to new normals.

Most water laws, institutions, and investments were **designed for a world in which hydrological variability was assumed to be stationary**[5,58–60] and crises were assumed to be temporary. Drought plans, emergency funds, and infrastructure portfolios were built around the idea that, once the shock passed, rivers would resume normal flows, aquifers would recover, and development trajectories could continue largely unchanged.

In water-bankrupt systems, this premise no longer holds as the underlying "accounts" have been depleted or degraded[5]. Baseline flows have fallen, storage has been lost, ecosystems have crossed tipping points, and the cryosphere is shrinking. Attempting to manage this reality with crisis tools alone produces three recurring failures:

1) Escalating emergency costs, as each drought or water shortage episode requires larger and more frequent interventions to protect the same set of promises;

2) Deepening ecological damage, as emergency pumping, transfers, dams, and supply expansions are used to sustain unsustainable uses and facilitate unsustainable growth;

3) Rising social conflict and inequality, as the burden of adjustment falls on those with the least power.

Bankruptcy management starts from a different premise: **some losses are now unavoidable,** and the central task is to prevent further irreversible damage while reorganizing the system around a smaller hydrological budget. It is forward-looking rather than nostalgic; it focuses on **re-allocating risk and opportunity** instead of endlessly patching symptoms. In a water-bankrupt system, the central governance question can no longer be: How do we get back to normal? The question becomes: How do we live within new, permanently constrained conditions without triggering further collapse or deepening injustice?

Managing water bankruptcy therefore requires a different logic: **Acknowledgement rather than denial** of irreversible losses and overshoot; **Prevention of further damage** as an explicit priority, not a by-product; **Rebalancing of claims and expectations** to match degraded carrying capacity; **Deliberate adaptation to new normals,** including social, economic, and spatial adjustments; and **Adopting justice-oriented approaches** that distribute unavoidable losses fairly and protect the most vulnerable.

This is not a technocratic shift in tools. It is a transformation in purpose. Instead of treating each drought, flood, or shortage as a discrete crisis to be "managed", water bankruptcy governance accepts that in many places, the baseline has shifted and will continue to shift. Its task is to prevent further liquidation of water capital, redistribute limited entitlements, and support societies in adapting to a reality that is already different from the one for which they were designed.

Declaring water bankruptcy at basin, aquifer, city, provincial, or national level is therefore not an admission of defeat alone. As in financial systems, a clear diagnosis of insolvency is a **precondition for a fresh start**. It opens political and institutional space to reset expectations, renegotiate claims, and design new arrangements that are realistic and just.

Satellite imagery (Sentinel-2, true color) captures the critical depletion of the Theewaterskloof Reservoir, near Cape Town, South Africa, in January 2018. Three months later, as the drought continued, the reservoir—the city's largest—dropped to a critical low of approximately 10%, effectively reaching 'dead pool' status. The January status triggered Level 6B emergency restrictions, limiting 4 million residents to just 50 liters of water per day to prevent the total exhaustion of the system and delay Day Zero.

4.2 Core Principles for Governing Water-Bankrupt Systems

Although contexts differ and every basin and country faces unique circumstances, water-bankrupt systems share common features that call for a shared set of guiding principles. Five principles are particularly important. These principles apply across scales, from local utilities and basin organizations to national governments and regional and global cooperation frameworks.

I. Tell the truth about limits and losses. Denial and delayed acknowledgement of failure are among the most damaging responses to water bankruptcy. When governments, utilities, city managers, or basin authorities insist that conditions are temporary, or promise a return to past levels of supply that are no longer hydrologically feasible, they lock societies into maladaptive investments and deepen over-extraction. **Transparent communication** about what has been lost, what cannot be restored, and what can still be saved is a precondition for any legitimate restructuring of claims.

Women in low income settlements along the Turag River in Dhaka, Bangladesh, use polluted surface water for washing dishes and laundry (27 January 2017). Water bankruptcy is about both quantity and quality. Once rivers are polluted, the truly usable fraction of available water is shrinking, even where total volumes may appear stable. Photo: Nushrat Yeasmin, REACH

II. Prioritize prevention of further irreversible damage. Once components of water capital are degraded beyond recovery, the system's options narrow. Bankruptcy management must therefore place **non-reversible thresholds** at the center of planning: protecting remaining wetlands and aquifers, preventing further land subsidence and saltwater intrusion, safeguarding key species and ecosystems, and maintaining minimum cryospheric and soil functions where they still exist. These should not be treated as optional co-benefits; they must be adopted as high-priority objectives and prerequisites for any viable future.

III. Align claims and expectations with degraded carrying capacity. In many human-water systems, the sum of legal rights, informal expectations, and development promises exceeds what the degraded system can supply. This claim–capacity mismatch and expectations-reality gap cannot be closed through marginal efficiency gains or new infrastructure alone. It requires **structural reductions and reallocations in demand**: revisiting water rights, revising crop mixes and land use patterns, reconsidering the size and location of cities and industries, and adjusting environmental flow commitments to what is ecologically essential and feasible. This rebalancing is politically sensitive, but unavoidable.

IV. Protect the vulnerable and share unavoidable losses fairly. Water bankruptcy tends to hit those with the least political and economic power the hardest: smallholder farmers, pastoralists, informal urban residents, rural populations, Indigenous communities, women, girls, and children, and downstream users. So water bankruptcy governance must explicitly integrate **equity and justice**, ensuring that the costs of adjustment are not simply shifted onto those least able to bear them. Compensation, social protection, livelihood diversification and legal safeguards are essential components of any credible restructuring.

V. Build institutions for continuous adaptation, not one-off fixes. In a changing climate and degrading environmental and hydrological landscape, no allocation, infrastructure plan, or agreement can be permanently stable. Institutions must be capable of **learning and adaptation,** with monitoring systems that track stocks and trends, procedures that trigger adjustment when thresholds are approached, and governance arrangements that include affected communities in decision making. Water-bankrupt systems cannot be governed by static plans; they require iterative, adaptive, and reflexive management.

4.3 Recognizing Insolvency, Acknowledging Irreversibility, and Declaring Water Bankruptcy

No transformation can begin without an **honest diagnosis**. In many human-water systems, water bankruptcy is de facto but not de jure: the system is insolvent, yet institutions continue to behave as if full recovery were possible. This denial delays necessary change and increases the eventual cost of adjustment.

Declaring water bankruptcy is a political act as much as a technical one. It involves:

1. **Transparent accounting of hydrological capital and liabilities:** Assessing long-term trends in total water storage, ecosystem condition, and service reliability, and comparing these with existing claims and development plans;

2. **Public acknowledgement of irreversible damage:** Recognizing explicitly where aquifers, wetlands, glaciers, river systems, and other water-relevant natural assets can no longer be restored to historic conditions within meaningful time frames;

3. **Formal recognition of a post-crisis state:** Adopting legal or policy declarations that a basin, aquifer, city, or region is operating under water-bankrupt conditions and requires special governance measures to fulfill justice and achieve sustainability.

Such declarations are essential to a fresh, truly transformative start.

PRIORITY NATIONAL AND BASIN-LEVEL ACTIONS FOR MANAGING WATER BANKRUPTCY

Diagnose stress, crisis, and bankruptcy honestly. Develop basin- and aquifer-level diagnostics that distinguish between water stress, water crisis, and water bankruptcy, using indicators of stocks, quality, and irreversibility—not just flows.

Prevent further irreversible damage. Put hard limits on activities that permanently degrade water and the underlying natural capital: destructive over-pumping, wetland and riparian loss, pollution that renders aquifers unusable, and the liquidation of soil, terrestrial, and cryospheric “savings” where protective measures are still possible.

Rebalance rights, claims, and expectations. Align legal rights, informal expectations and development promises with the degraded hydrological carrying capacity, while securing basic human needs, essential public services, and critical ecosystem functions as first priorities.

Ensure just transitions and protect the vulnerable. Design water and land reforms so that farmers, pastoralists, Indigenous Peoples, rural communities, women, youth and low-income urban residents do not bear the costs of adjustment alone. Use compensation, social protection, and livelihood diversification to support transitions away from unsustainable uses.

Transform water-intensive sectors and development models. Move beyond marginal efficiency gains in agriculture, industry, and cities towards changes in crop choices, irrigated area, production systems, virtual water trade, urban growth patterns, and regional economic strategies that decouple prosperity from ever-increasing water use.

Address illegal and informal withdrawals and water-quality degradation. Bring unregulated wells, abstractions, and discharges into transparent, enforceable frameworks. Control pollution and salinization so that remaining water is fit for purpose and does not accelerate bankruptcy.

Build institutions for continuous adaptation. Establish or strengthen basin authorities and regulatory bodies with mandates and tools to monitor stocks and quality, enforce caps, trigger adjustments when thresholds are approached, and involve affected communities in decision making.

4.4 Rebalancing Demand and Reconfiguring Uses

Demand management has always been part of water policy, but in water-bankrupt systems it moves from being one option among many to being the **central lever.** The goal is not simply to “use water more efficiently” within an unchanged development model, but to **bring total claims back within a degraded carrying capacity**, while safeguarding basic human needs and ecological integrity. Rebalancing demand in a water-bankrupt system involves at least four fundamental strategies.

1) Securing basic human needs and critical services

Water bankruptcy always reveals a **claim–capacity mismatch**: the sum of legal rights, illegal uses, informal expectations, and development promises exceeds the degraded carrying capacity of the system. Bankruptcy management begins by first writing down claims and then identifying **non-negotiable minimums**: access to sufficient, safe, and acceptable-quality water for drinking, sanitation and hygiene; essential health and education facilities; basic subsistence food production; and critical ecosystem functions that sustain life and livelihoods. These minimums must be protected even as other uses are curtailed or reallocated.

This requires:

a) Establishing or strengthening **human-right-to-water guarantees**, including lifeline tariffs and protection against disconnection through service standards and tariffs that secure a **minimum lifeline supply** for all households;

b) Targeted investments that prioritize loss reduction and improving service reliability and access, especially in **low-income, under-privileged, and marginalized communities**; and

c) Clear rules that safeguard **priority environmental flows** in key stretches of rivers and wetlands, even under drought.

Failure to secure basic needs and these minimums risks cascading failures in health, social stability, and long-term resilience.

2) Transforming agriculture

Globally, agriculture remains the largest water user and the sector most locked into unrealistic assumptions about availability. In water-bankrupt systems, incremental **efficiency gains are not enough** if the total irrigated area, crop choices, production models, and food security and self-sufficiency plans remain misaligned with hydrological realities. On the contrary, efficiency improvements can even lead to rebound effects (Jevons paradox) and increase total water consumption and reduce return flows and groundwater recharge if there are no mechanisms in place to cap overall use and reduce consumption.

At the same time, **poorly designed reforms can deepen poverty and instability.** Rapid cuts to water allocations or blanket removal of agricultural

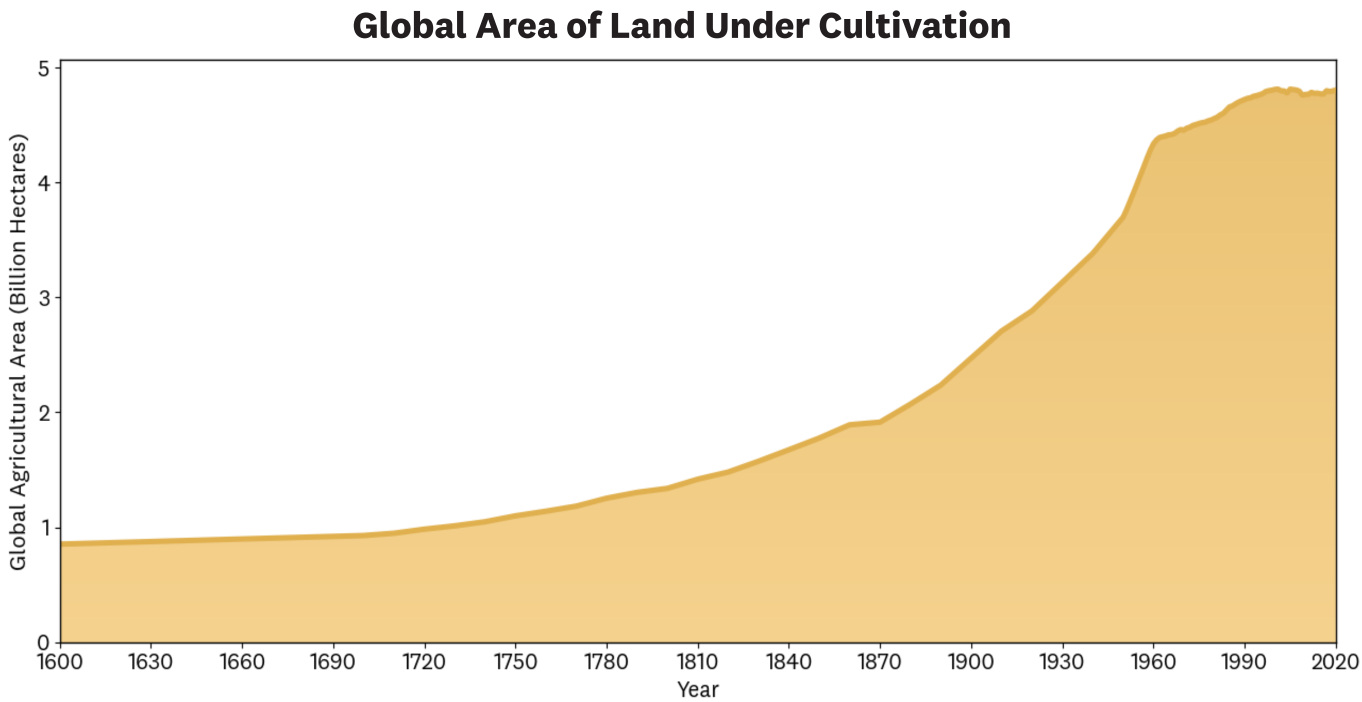


Figure 16. Total global agricultural area over time. The chart shows the growth in total agricultural area across the globe during the 1850-2020 period. Growth in farmed area is normally associated with increased water consumption, often at the cost of reducing the water share of the environment, with major irreparable damages to natural capital. Chart produced using data from Our World in Data.


Women farmers protest at the Tikri Border, India, on 31 December 2020, fearing for their families' economic and ecological survival. Women, who perform the majority of India's agricultural labor, joined the year-long protest to demand the repeal of three market deregulation laws. They feared that the removal of guaranteed crop prices (Minimum Support Price, or MSP) would hand control of their ancestral lands and dwindling groundwater resources to corporate monopolies. Photo: Randeep Maddoke, Wikimedia Commons

subsidies, without alternatives, can destroy livelihoods, accelerate distress migration, and undermine social support for the very transitions that are needed. **Transforming agriculture in water-bankrupt systems, therefore, has to follow a just-transition logic**: reducing pressure on water while protecting farmers and rural communities, and creating new opportunities where old ones are no longer viable.

A bankruptcy-aware approach to agricultural reform includes several elements. First, it recognizes that certain parts of current production are simply incompatible with the reduced carrying capacity of the system. Phasing out highly water-intensive, low-value crops in the most stressed areas, or reducing irrigated area where over-expansion has occurred, will often be unavoidable. But such measures must be **gradual, predictable, and accompanied by support**, including compensation for stranded investments, access to credit, extension services for switching to less water-intensive crops and practices, and social protection where income losses are unavoidable in the short term.

Second, it links water reform to **broader rural development and economic diversification**. Farmers and rural workers need viable alternatives, not only tighter constraints. Investment in value chains for more drought-resilient crops, agro-processing, sustainable livestock systems, agroforestry, ecotourism, and non-farm rural enterprises can help decouple rural prosperity from ever-growing water use. Where opportunities outside agriculture are limited, policies that encourage labor-intensive, low-water industries can ease the transition away from over-reliance on irrigated production.

Third, agricultural water reform must be coordinated with **trade and food-security policy**. In some water-bankrupt basins, continued pursuit of full food self-sufficiency is neither realistic nor desirable. Carefully managed reliance on virtual water imports, combined with measures to protect vulnerable consumers from price volatility, can relieve pressure on local resources while maintaining food security. Conversely, exporting large volumes of water-intensive commodities from water-bankrupt regions effectively externalizes local overshoot into global markets and should be reconsidered.

Fourth, agricultural transitions should **actively rebuild the natural systems that store and regulate water**. On-farm and landscape-scale practices that improve soil structure and organic matter, such as conservation tillage, cover crops, agroforestry, and controlled grazing, can increase infiltration, reduce runoff, and enhance soil moisture storage, making rainfed and supplemental irrigation systems more resilient. At basin scale, nature-based solutions, including the protection and restoration of wetlands and floodplains, reforestation of critical recharge zones, and carefully designed managed aquifer recharge schemes where hydrogeological and water quality conditions allow, can retain water and slow water loss, support partial groundwater recovery, and reduce the intensity of both droughts and floods. In water-bankrupt systems, these measures cannot fully replace lost glaciers or deeply depleted aquifers, but they can stabilize remaining water and natural capital, improve reliability for farmers, and reduce dependence on increasingly costly grey infrastructure.

3) Diversifying economies and decoupling growth from water use

Water bankruptcy is often a symptom of deeper economic structures in which growth, employment and fiscal stability depend on ever-increasing water withdrawals. In such contexts, demand-side measures within individual sectors will not be enough. **A core task of bankruptcy management is to diversify economies so that prosperity is no longer tightly coupled to water use and degradation of natural capital in depleted systems**.

For many countries and regions, this involves a strategic shift away from heavy dependence on water-intensive primary production—such as irrigated monocultures, water-hungry extractive industries, water-demanding electricity generation plants, or thirsty data centers—toward less water-dependent sectors, including knowledge-based services, manufacturing with low water footprints, and water-friendly renewable energy technologies. This does not mean abandoning agriculture or industry, but **rebalancing the economic portfolio** so that the pressure on water is reduced and systemic risk is spread more evenly.

Water, employment, and national stability are tightly intertwined[61]. In many countries, irrigated agriculture and water-intensive industries are not only major employers but also pillars of rural incomes, food security, and political support, which helps explain why governments have often resisted meaningful cuts in withdrawals even when systems are clearly overdrawn. A political-economy lens is therefore essential: **without deliberate efforts to decouple economic prosperity and national security from ever-growing water use in depleted basins, bankruptcy management will run up against powerful vested interests and legitimate fears about jobs, migration, and social unrest.**

Economic diversification is a long-term process that goes beyond the remit of water authorities. It requires planning at the highest levels of government and coordination between water, finance, planning, industry, agriculture, and labor ministries, and must be supported by education, skills development, and social policy so that workers can move into new sectors without being left behind. **From a water-bankruptcy perspective, economic diversification is not a luxury;** it is a structural adaptation that reduces the temptation to keep liquidating natural capital simply to sustain short-term employment or revenues.

4) Rethinking urban and industrial development

Cities and industries are central to the water-bankruptcy story. Many have grown on the assumption that new dams, water transfers, wells, or desalination plants will always be able to meet their rising demand. In water-bankrupt systems, this assumption has broken down. Continued expansion of water-intensive urban and industrial footprints in already depleted systems risks locking in new vulnerabilities and social disparities. To comply with the world's new water realities, **urban and industrial expansion must be re-scaled and re-located** in line with actual hydrological limits.

A bankruptcy-aware approach to urban and industrial development has several implications. First, **growth must be aligned with actual hydrological limits.** Urban and regional planning should explicitly take water availability and ecosystem thresholds into account[62] when deciding where and how cities and industrial zones expand.

Second, cities need to move beyond emergency responses and adopt permanent **demand-management and diversification portfolios**: reducing leaks, improving efficiency in buildings and industries, scaling up reuse and recycling, and integrating non-conventional sources such as safely managed treated wastewater where appropriate.

Third, the social dimension of urban water adjustment needs to be front and center. In many cities, informal settlements and low-income neighborhoods already live in a permanent "Day Zero", relying on tanker trucks, informal vendors, or unreliable standpipes. **Water bankruptcy governance must avoid solutions that protect high-income users while shifting scarcity onto the poor**. Tariff reforms, service priorities, and investments should be designed to reduce, not exacerbate, existing inequalities in access, affordability and reliability.

Finally, industrial policy should be revised so that new high-water-use industries are not sited in water-bankrupt basins, and existing industries are supported through technology, regulation, and incentives, to dramatically reduce their water footprints or relocate where necessary. Just as climate policies have begun to align investment away from high-carbon activities in many parts of the world, **water policy must gradually align investment away from water-intensive activities in systems that can no longer sustain them**.

A municipal truck dumps hazardous waste directly into the Huallaga River in 2016, a practice that persisted for over 30 years near Tingo María, Peru. This systemic pollution added approximately 34 tons of daily refuse and biocontaminated hospital waste to the waterway. While the city has since transitioned to a modern landfill, the environmental 'toxic debt' remains; decades of accumulated pollutants continue to compromise the river's ecological health and the safety of downstream communities. Photo: Wikimedia Commons

4.5 Restructuring Rights, Claims and Institutions

In many water-bankrupt systems, the legal and institutional frameworks governing water allocation were designed in an earlier era of apparent abundance. Rights, permits, and expectations accumulated over decades, often without factoring in environmental needs, Indigenous and customary claims, pollution control, or the finite nature of groundwater and cryospheric “savings accounts”. Bankruptcy management therefore requires a **careful restructuring of rights and claims**, not simply tougher enforcement of an unsustainable status quo.

Rebalancing claims begins with a **transparent accounting** of who uses how much water, under what authority, and with what impacts on others and on ecosystems. This often reveals highly unequal patterns of use, where a small number of large users, whether irrigated estates, industries, or cities, hold a disproportionate share of legally protected entitlements. These imbalances are further complicated by the widespread growth of illegal and informal withdrawals, which effectively create a shadow layer of claims that must be confronted if water management is to be credible and effective.

In some regions, a significant share of water abstraction now takes place outside formal rules through illegal wells, unlicensed intakes, tampering with meters, or systematic under-reporting. These practices are not marginal; they have become part of the de facto allocation regime, further widening the gap between official claims and actual withdrawals. They are also **a symptom of deeper failures**: political, institutional, and societal denial of scarcity, weak enforcement capacity, lack of viable alternatives for users, and, in some cases, capture of regulatory institutions by powerful interests.

Bankruptcy governance cannot ignore these realities or treat them only as a policing problem. Simply closing illegal wells overnight, without alternatives, can destroy livelihoods and drive withdrawals further underground. At the same time, tolerating them indefinitely makes any attempt to bring use within the degraded carrying capacity impossible. **A balanced approach** is needed: systematic mapping and monitoring of illegal and informal uses; pathways to regularize and license some users under stricter caps and conditions; targeted closure of the most damaging withdrawals (for example, deep, high-capacity wells in critical aquifers); and enforcement that is even-handed and transparent, rather than focused only on smallholders while large, politically connected users remain untouched. Where illegal wells have become a de facto social safety net, closure must be accompanied by support for alternative water sources, income opportunities, and social protection, so that bringing uses back within legal and hydrological limits does not simply transfer the costs of past neglect onto the poorest.

A man draws water from the Timinit Well in Mauritania (January 2019). In many water-bankrupt regions, ancient customary claims coexist with modern legal frameworks. Where informal access acts as a vital social safety net, bankruptcy governance must avoid simply 'policing' the poor. Bringing total withdrawals back within safe hydrological limits must be achieved without transferring the costs of past systemic neglect onto the world's most vulnerable users. Photo: Valerian Guillot

Bringing total claims back within a reduced carrying capacity may require **a mix of voluntary and mandatory measures:** negotiated reductions, buy-back schemes, time-bound permits, and priority rules that protect basic human needs and ecological functions in times of shortage. Crucially, these processes must be designed to **avoid simply expropriating small users while leaving large interests intact**. Historical patterns of benefit and responsibility should inform who bears which share of the adjustment. Where large users have profited from past over-extraction, it is reasonable that they contribute more to the costs of transition through reduced allocations, investment in efficiency and restoration, or financial contributions to compensation and social protection schemes.

Institutionally, water-bankrupt systems require **strong, legitimate basin-level authorities** capable of coordinating across sectors and jurisdictions, as well as mechanisms for joint and inclusive decision-making in shared rivers and aquifers. Existing institutions may need new mandates, powers, and capacities to manage post-crisis realities, including the ability to enforce caps, oversee reallocation, and mediate conflicts. Without such institutions, even the best-designed reforms are unlikely to be implemented fairly or consistently.

4.6 Reorienting Infrastructure, Technology, Finance and Trade

Recognizing water bankruptcy also changes the role of infrastructure, technology, and finance. Large dams, inter-basin water transfers, groundwater exploitation, and desalination have enabled development in many regions, but in water-bankrupt systems, **simply adding more supply can deepen overshoot** by promoting further development and increased consumption[63], masking the severity and urgency of problems to be addressed, supporting institutional, social, and political denial of failure, and postponing the necessary structural changes.

Investment strategies should therefore shift toward **protecting and rebuilding remaining water and natural capital**, increasing resilience rather than expanding unsustainable uses. This includes rehabilitating aging infrastructure to reduce losses, investing in nature-based solutions that restore wetlands, floodplains and recharge zones, upgrading distribution networks to decrease losses and improve reliability and equity, and expanding wastewater collection, treatment, and safe reuse to recover usable water while reducing pollution loads. Technological options such as desalination and wastewater reuse can play important roles, especially for securing drinking-water supplies in coastal and water-short cities, but they should be embedded in **demand-management and diversification strategies**, and assessed for their energy use, environmental impacts and distributional consequences. Otherwise, they will function as typical supply-oriented measures that promote further growth and consumption, a "fix that backfires"[64,65].

Finance and trade systems also need to be brought into alignment with water reality. Public budgets, multilateral development banks, and private investors should systematically **screen investments for water-bankruptcy risk**, avoiding projects that depend on non-existent future water or that further degrade critical natural capital. Subsidies and incentives that currently encourage over-pumping, expansion into fragile landscapes, or water-intensive export crops in depleted basins should be gradually redirected toward efficiency, restoration, economic and livelihood diversification, and social protection.

At the same time, **trade policy and global value chains** should recognize their role in driving water use in producer regions. Concentrating global food and commodity production in a handful of water-bankrupt basins is a systemic risk. Diversifying sourcing, promoting production in basins that remain within their carrying capacity, and encouraging certification or disclosure schemes that consider water depletion and degradation can help reduce pressure on the most fragile systems and spread risks more fairly.

A woman collects water for her household in the Maldives. With more than a quarter of households living on less than $2 a day, water shortages exacerbated by climate change represent an even more urgent threat to the Maldives' low-lying islands and many other Small Island Developing States (SIDS) than sea-level rise. While global finance often targets large-scale infrastructure projects, the immediate burden of scarcity falls on the poorest households, making equitable distribution and the protection of natural capital both a moral and economic necessity. Photo: UNDP Maldives (2021)

4.7 From Crisis Management to Bankruptcy Management

Water bankruptcy is as much a political and ethical challenge as it is a hydrological one. Decisions about who must cut back, who receives compensation, which regions are prioritized for investment, and how ecosystems are valued will shape social cohesion for decades. If these decisions are made behind closed doors, or if they systematically favor already powerful groups, water bankruptcy management risks becoming a driver of instability and injustice rather than a pathway to resilience.

A just approach to water bankruptcy management requires meaningful participation and inclusive, transparent, and just decision-making. Affected communities, including smallholder farmers, pastoralists, Indigenous Peoples, women, youth, and low-income urban residents, should have a voice in shaping reallocation plans, infrastructure choices, and adaptation strategies. Participatory platforms, citizen assemblies, and co-management arrangements can help to surface local knowledge, identify acceptable trade-offs, and build legitimacy for difficult decisions. These participatory approaches also give concrete expression to procedural obligations embedded in international human rights law and environmental law, including the duties to ensure access to information, public participation in decision-making, and access to justice in environmental matters.

Given that rebalancing claims inevitably creates losers as well as winners, **grievance and conflict-resolution mechanisms are essential**. Basin councils, ombuds institutions, customary authorities, and, where necessary, third-party mediators can help manage disputes before they escalate into violence. Human-rights frameworks, particularly the rights to water and sanitation, to food, to health, and to a clean, healthy, and sustainable environment, provide a normative compass for evaluating options and ensuring that the most vulnerable are protected.

While many of these reforms must be led at national

Members of the Women in Water Diplomacy Network (WWDN) during the Second Global Network Forum in March 2024, bringing together more than 70 water diplomats to Vienna. Women's leadership in water diplomacy can help strengthen transboundary cooperation through advancing gender equality, meaningful participation, and inclusive, transparent, and just decision-making across the water sector. WWDN is a community of practice comprised of both formal and informal women water diplomats, decision-makers, and experts, with focus on shared waters in water-insecure and conflict-sensitive regions of the world, working globally with its members to advance women's representation in transboundary water governance and to raise awareness of the importance of inclusivity at all levels of management. Originating in the Nile Basin in 2017, the Network is now a global community of women water leaders and allies working collectively to strengthen women's leadership in transboundary water decision making with member communities in the Nile, Central Asia-Afghanistan, South Africa, North America, the South Caucasus, and elsewhere. Photo: Letizia Zuliani, OSCE

Bolivian delegates at the UN 2023 Water Conference attend the special event, 'Reducing Inequalities – Implementing Human Rights.' Managing water bankruptcy is as much an ethical challenge as a hydrological one, requiring a shift away from 'stationarity'—the outdated assumption that water cycles remain constant. Water justice in the Anthropocene depends on reinterpreting equitable use to protect Indigenous Peoples and marginalized groups. By centering human rights as a normative compass, international governance can ensure that the reallocation of dwindling transboundary resources serves as a pathway to resilience rather than a driver of geopolitical instability. Photo: UN, Manuel Elías

and basin levels, they cannot succeed in isolation. Trade rules, climate, biodiversity, and land protection finance, international river basin agreements and global reporting frameworks all shape the incentives and constraints that states and other actors face. Accordingly, the United Nations system and multilateral processes must evolve to support water-bankrupt societies rather than inadvertently reinforcing overshoot.

In transboundary basins and shared aquifers, justice also has legal and international law dimensions. Water bankruptcy conditions can exacerbate tensions between riparian states, particularly where existing treaties or practices were built on flows that no longer exist due to anthropogenic changes, including climate change, increased water withdrawals, land use change, soil degradation, deforestation, desertification, and all environmental changes that disrupt the hydrological cycle, reduce transboundary river flows, and deplete shared aquifers. Cooperative renegotiation of allocations, joint monitoring and data sharing, shared adaptation strategies, and new international regulatory mechanisms and legal frameworks for dealing with the world's new water realities in the Anthropocene are essential **to prevent hydrological insolvency and irreversibility from becoming a driver of broader geopolitical instability.**

Existing international water law principles, such as equitable and reasonable utilization, the obligation not to cause significant harm, and the duty to cooperate under instruments like the 1997 UN Watercourses Convention and the 1992 UNECE Water Convention, were largely articulated based on the assumption of hydrological stationarity and now face new tests in basins where long-term depletion and quality degradation have fundamentally altered baseline conditions. In this context, strengthening procedural duties of notification, consultation and environmental impact assessment, and reinterpreting "equitable and reasonable use" in light of declining and degrading water flows, changing climate, and irreversible environmental damages, will be critical to **aligning transboundary legal regimes with the realities of surface water and groundwater bankruptcy.**

CHAPTER 5

THE WAY FORWARD—A NEW WATER AGENDA TO UNITE IN A FRAGMENTED WORLD

A bird's-eye view of the stark contrast between forest and agricultural landscapes near Rio Branco, Acre, Brazil. Deforestation destroys the underlying natural capital essential for water production, disrupting the hydrological cycle and driving water bankruptcy. Elevating water on the global agenda can help reunite a fragmented world and reaccelerate cooperation on the Rio Conventions to fight climate change, biodiversity loss, and desertification. Photo: Kate Evans, CIFOR

5.1 Resetting the Global Water Agenda

The diagnosis offered in this UNU-INWEH report is stark: **the world has already entered an era of Global Water Bankruptcy**. Many human–water systems are now operating in a post-crisis failure mode, where long-term water use and accumulated damage have pushed them beyond their hydrological carrying capacity and degraded the natural capital on which recovery depended. In these systems, crisis management aimed at restoring a lost normal is no longer a viable strategy. Bankruptcy management, anchored in honest diagnosis, prevention of further irreversible damage, demand reduction, adaptation to new norms, and just transitions, is now the central task.

The report laid out the elements of this diagnosis. It argued that the familiar language of “water crisis” and “water stress” no longer captures the reality of systems in which past baselines have been permanently lost. It presented evidence on how chronic overextraction, anthropogenic drought, water quality degradation, and ecological collapse have pushed many rivers, lakes, aquifers, wetlands, glaciers, and ecosystems beyond safe thresholds in different parts of the world. It introduced water bankruptcy as a distinct post-crisis state, an outcome of long-term overshoot in which both the volume and quality of water and water-related natural capital are degraded to the point that full restoration is no longer realistic. It then outlined what bankruptcy management entails in practice: preventing further irreversible damage, reducing and reallocating demand, restructuring rights and institutions, addressing illegal and informal withdrawals, and ensuring that transitions are just and politically viable.

The sobering reality of water in the Anthropocene also opens **a window of opportunity**. In a world marked by rising geopolitical tensions, deepening inequalities between and within nations, and fragmented multilateralism, water remains **a uniquely shared concern and a potential connector**. Every country, sector, and community depends on water; no actor can secure its future without others.

If recognized and governed as such, Global Water Bankruptcy can become not only a warning, but also **a catalyst for renewed cooperation**, for bridging divides between the left and the right, and between North and South, and for revitalizing international environmental frameworks that are struggling to deliver. **In a fragmented world where many multilateral processes are gridlocked, water offers a concrete, shared entry point** around which states, cities, communities, and regions can organize practical cooperation even when agreement on broader geopolitical questions remains elusive.

Accordingly, **this report calls for an explicit recognition of Global Water Bankruptcy in global policy debates** and proposes how the United Nations system and the Rio Conventions can integrate this diagnosis into their work. Taken together, the upcoming UN Water Conferences in 2026 and 2028, the 2028 conclusion of the International Decade for Action “Water for Sustainable Development”, and the 2030 deadline for achieving SDG 6 are **critical milestones for resetting the global freshwater agenda**, capitalizing on water as a strong foundation for peace-building and solidarity in an increasingly fractured world, and reaccelerating the halted progress of international environmental negotiations.

Water: A Catalyst for Cooperation. This photo by Andrew Hart (12 April 2009) is a reminder of the sobering reality of the Anthropocene and the rising competition in a water-bankrupt world. While locked faucets symbolize a system in failure, water remains a uniquely shared concern that transcends geopolitical divides. Recognizing Global Water Bankruptcy provides a rare opportunity for fragmented societies to unite and reaccelerate cooperation. By centering a new agenda on solidarity, justice, and peace, the global community can turn water into a foundation for renewed multilateralism.

5.2 From Local Symptom to Global Condition

Water bankruptcy is experienced locally: by a farmer watching a well go dry, a city preparing for Day Zero, a fishing community facing a vanishing lake, or a small island nation confronting saltwater intrusion. **But its causes and consequences are increasingly global.** Trade patterns link the fate of overdrawn basins to food and commodity markets thousands of kilometers away. Financial flows shape which infrastructures are built and which production systems are expanded or retired. Climate change, driven largely by greenhouse gas emissions from energy, industry and land-use sectors, alters hydrological baselines everywhere. Migration and displacement driven by water shortage and drought reverberate through labor markets, social protection systems, and political dynamics far from the original source.

In this sense, **Global Water Bankruptcy is not the simple sum of many local crises**. **It is a systemic condition of the global human-water system**: a pattern of chronic overshoot, irreversible damage, and deepening claim-capacity mismatches that is now embedded in development, trade, energy, food and security regimes. Recognizing this global dimension is essential. It implies that water bankruptcy governance cannot be left to individual basins or countries alone. It requires coordinated action across multiple levels—local, national, regional and global—and across policy domains that have historically treated water as a secondary concern.

Paired satellite images of Lake Corpus Christi, Texas, U.S.A., documenting the systemic retreat of surface water between October 2021 (left) and October 2025 (right). Locally, this collapse triggered Stage 2 and 3 drought restrictions for the city of Corpus Christi and decimated the regional citrus and sugar industries, where over-allocation has met a vanishing hydrological baseline. While experienced as a local disaster, this is a symptom of Global Water Bankruptcy—a condition where "claim-capacity mismatches" are now embedded in trade and food regimes. It serves as a stark reminder that water governance requires a global shift to manage the irreversible loss of the natural capital upon which livelihoods depend locally and globally. Photos: Michala Garrison, NASA Earth Observatory (OLI on Landsat 8 and OLI-2 on Landsat 9, respectively; false color (OLI bands 7-5-4) to emphasize the presence of water).

5.3 Elevating Global Water Bankruptcy in the UN system and Rio Conventions

A new global agenda for water must therefore take **Global Water Bankruptcy as a starting point** rather than an afterthought, treating the distinction between stress, crisis and bankruptcy, as well as the associated notions of hydrological carrying capacity, anthropogenic drought, insolvency, and irreversibility, as core organizing concepts for international cooperation. Trade, finance, migration, climate feedbacks, and shared ecosystems connect water-bankrupt systems across borders. **Managing Global Water Bankruptcy therefore requires stronger international cooperation and a higher profile for water across the multilateral system**.

The three Rio Conventions on climate change, biodiversity, and desertification, together with the processes around the Water Action Decade (2018–2028) and fulfillment of SDG 6 by 2030, the follow-up to the UN 2023 Water Conference, and the upcoming UN Water Conferences of 2026 and 2028 have vital roles to play.

Each Rio Convention already touches water in important ways: climate change mitigation and adaptation measures affect hydrology and the degrading water capital intensifies climate change; biodiversity frameworks depend on healthy freshwater ecosystems; desertification and land-degradation agendas are intimately linked to soil moisture, drought, and water management. Yet in practice, **water is often treated as a co-benefit or secondary variable** rather than as a core structuring constraint and opportunity.

PRIORITY UN SYSTEM ACTIONS AND GLOBAL PROCESSES FOR MANAGING GLOBAL WATER BANKRUPTCY

Recognize Global Water Bankruptcy explicitly. Integrate the stress–crisis–bankruptcy framework into the work of the Rio Conventions, SDG follow-up and review, UN-Water coordination, and mission of relevant UN bodies, treating water as a core structuring factor rather than a downstream impact.

Develop a Global Water Bankruptcy monitoring framework. Build on existing UN and partner efforts to track total water storage, groundwater depletion, wetland and glacier loss, water quality degradation and key markers of irreversibility and claim–capacity mismatch, using advances in Earth observation, satellite technologies, AI, and integrated modeling.

Support national and basin-level diagnostics and just-transition strategies. Provide technical, financial, and institutional assistance to Member States and regions to assess their status (stress, crisis, or bankruptcy), identify tipping points, and design mitigation and adaptation strategies that bring demands back within degraded carrying capacities.

Champion water as an opportunity sector for the Rio Conventions. Use water-related commitments and investments to deliver co-benefits and drive progress on fighting climate change, biodiversity loss, and desertification, rather than treating water only as a victim of these crises.

Use the 2026 and 2028 UN Water Conferences and the 2028–2030 milestones as turning points. Employ these events to recognize Global Water Bankruptcy in political declarations; call for a new global water agenda aligned with Anthropocene realities; scale up dedicated global and regional water funds; increase the share of climate and environmental finance directed to water-related action; and strengthen the links between water, peace-building, and conflict prevention.

At the same time, **the current global water agenda remains heavily skewed toward a narrow subset of issues**. The emphasis on drinking water, sanitation and hygiene (WASH)—while morally and politically essential—does not capture the full scale and complexity of Global Water Bankruptcy. Water quality degradation, groundwater depletion, ecological collapse, agricultural water overuse, and the growing risk of transboundary conflicts often remain at the margins of global discussions. **Popular frameworks such as Integrated Water Resources Management (IWRM) have been promoted for decades, but they have not fully accounted for the realities of the Anthropocene**: insolvency, irreversibility, non-stationarity, political economy constraints, and the structural overshoot that defines water bankruptcy. In many places, they have neither prevented depletion nor resolved deepening conflicts over shared waters.

A new agenda must therefore move beyond an incremental extension of existing approaches. **It should explicitly address the full spectrum of water uses and users**, including agriculture, ecosystems and energy, and recognize that the central challenge is not only to expand access to services, but to bring entire human–water systems back within degraded carrying capacities **while protecting rights and avoiding new injustices.**

Roughly 70% of the world's water withdrawals are for agriculture, much of it for farmers in the Global South. **For many of the Global South nations, water is not an abstract environmental topic, but the foundation of food security, employment, rural stability, and national identity**. Yet their concerns have often been sidelined in global negotiations that focus primarily on emissions trajectories, technological mitigation pathways, or urban service delivery. Thus, many governments in the Global South perceive that their water realities such as groundwater depletion, declining water flows, salinization, land subsidence, desertification, sand and dust storms, and recurring droughts, have not received the attention or resources they deserve in such negotiations. Elevating the role of water in the global policy agenda and environmental negotiations can rebuild trust, promote cooperation, make discussions more inclusive, and ensure solutions are more practical and relevant to global socio-economic, political, and environmental realities.

Even in high-income countries, water can also be a bridge between political camps that are otherwise divided. Farmers in several industrialized economies continue to perceive climate and environmental policies as threats to their livelihoods. Elevating water in the global policy agenda and integrating water into international environmental negotiations will be not only a step toward earning the trust and support of Global South nations, but also some Global North nations whose political priorities and water realities are not well appreciated and reflected in the current environmental agendas.

In 2016, over 250,000 people in Ethiopia were displaced as their traditional way of life became hydrologically "insolvent." This photo from the Siti zone in the country's Somali region—one of the hardest hit—illustrates how water is the direct foundation of subsistence and survival: once the water is gone, the livestock die, and the systems that sustain human life vanish. Three failed rains led to the death of nearly all livestock in parts of the Somali region. For pastoralists, water is the source of all life; without it, there are no animals—and without animals, there is no milk, no income, and no food security. While 2016 was the worst drought in 50 years, it was a precursor to an even more severe multi-year drought in 2020–2023, signaling a permanent shift in regional stability. Photo: Anouk Delafortrie, ECHO, EU (7 March 2016)

5.4 Water as a Bridge Between Fractured Societies and a Fragmented World

The bulk of action on water bankruptcy will still be decided and implemented within countries, basins, and communities. This makes water also **a unifying issue in national politics** precisely because it cuts across ideological and sectoral divides. It is the concern of farmers and rural communities who feel marginalized and left behind even in high-income countries, and of urban and peri-urban populations whose livelihoods depend on secure water access.

A bankruptcy-aware water agenda that supports adaptation through more realistic water allocations, investments in efficiency and recharge, alternative crops and livelihoods, and fair compensation for reduced use can ease tensions between these constituencies and environmental objectives. It demonstrates that environmental stewardship and prosperity are not inherently in conflict when water realities are acknowledged early and honestly.

Recognizing Global Water Bankruptcy offers a way to **align local and national agendas with global ones.** Better water management is not only an adaptation strategy; it is also a **mitigation and resilience strategy**. Protecting wetlands, peatlands and soils, reducing unnecessary pumping, restoring vegetative cover, and rethinking irrigation practices can reduce emissions, enhance carbon sequestration, improve biodiversity, and increase resilience to droughts and heatwaves. Investing in water security for farmers and vulnerable communities reduces social tensions, enhances food security in an era of trade disruptions and export bans, and lowers the risk of protests and political polarization. This is what makes water an **investment and intervention opportunity sector** for addressing global environmental concerns in line with national environmental and human security priorities.

Wildfire and Shared Vulnerability. Increased fire activity across California, U.S.A., in recent years highlights how water deficit targets both low-income communities and high-income constituencies alike. As drought reduces soil moisture and water availability, the resulting environmental instability and risk of catastrophic wildfire becomes a shared vulnerability that ignores socio-economic boundaries, making water a unifying national concern. Addressing these types of water-related concerns is no longer just an ecological goal, but a fundamental requirement for human security, locally, nationally, and globally. Photo: CAL FIRE (2024).

Rural-Urban Fractures in The Hague, Netherlands. On 1 October 2019, thousands of farmers at the Malieveld protested a sudden freeze on agricultural permits after a court ruled that the government could no longer ignore nitrogen and phosphate pollution in groundwater and soil. Water management often becomes a flashpoint for political polarization when environmental objectives are perceived as threats to rural livelihoods. Without "hydrologically credible and socially viable" transition pathways, water policy reforms can lead to profound fractures in national politics—even in high-income nations. Photo: Donald Trung Quoc Don, Wikimedia Commons

The new water agenda for the Anthropocene must therefore be rooted in national political economies. It should help governments understand which sectors and regions are already in or near water bankruptcy, identify who bears the risks and who has historically benefited from overshoot, and design transition pathways that are both hydrologically credible and socio-politically viable.

5.5 The Upcoming UN Water Conferences in 2026 and 2028

The upcoming United Nations Water Conferences in 2026 and 2028 offer **rare political windows to reset the global freshwater agenda in line with the realities of Global Water Bankruptcy**. These meetings can and should move beyond incremental calls for "more action" on a vaguely defined water crisis. Instead, they can anchor water as a central organizing concept for international cooperation and as a high-leverage entry point for advancing the stalled climate, biodiversity, and land agendas. To do so, they should:

I. Recognize that the current global water agenda is no longer fit for addressing Anthropocene water realities and Global Water Bankruptcy, as the existing focus, centered mainly on WASH, incremental efficiency gains, and generic IWRM prescriptions, will not be sufficient to resolve escalating water risks and will increasingly compromise progress on other agendas, including the UN SDGs and the Rio Conventions. The Conferences should therefore call for the development of a new global water agenda that aligns with the world's new water realities and elevates water within the broader UN policy architecture.

II. Explicitly and urgently recognize Global Water Bankruptcy in political declarations and outcome documents, acknowledging that many human–water systems around the world have already crossed thresholds where historical conditions cannot be restored and that governance must adapt accordingly. Further delaying the recognition of the insolvency and irreversibility of these systems will only deepen the degradation of global water and natural capital, increasing the economic, environmental, and socio-political costs of adjustment for UN Member States and communities, especially farmers and rural, marginalized, underprivileged, and vulnerable populations.

III. Mandate the development of a Global Water Bankruptcy monitoring framework, building on existing UN and partner efforts, that tracks total water storage trends, groundwater depletion, loss of wetlands and glaciers, degradation of freshwater ecosystems, and key markers of irreversibility and claim–capacity mismatch, and that leverages advances in Earth observation, satellite technologies, artificial intelligence (AI), and integrated modeling to provide timely, accessible and actionable information.

IV. Commit to supporting national and basin-level "water bankruptcy diagnostics", helping UN Member States and regions assess whether and where their systems are in stress, crisis, or bankruptcy, and to design mitigation and adaptation responses that bring demands back within degraded carrying capacities. This support should combine technological solutions, such as new engineering infrastructure, monitoring and data platforms, and decision support systems, with policy and institutional interventions, including legal reforms, allocation rules, and economic instruments, that enable fair and effective implementation.

V. Position water as an opportunity sector for the Rio Conventions, by clearly articulating how investments in addressing water bankruptcy, including protecting and restoring freshwater ecosystems, reducing overuse, improving land and soil management, and enhancing water security, directly contribute to climate mitigation and adaptation, biodiversity conservation, as well as land-degradation neutrality and combating desertification. The Conferences should call for enhanced integration of water into UNFCCC, CBD and UNCCD processes and use water-related commitments to help break negotiation deadlocks and re-accelerate progress on the triple planetary crisis.

VI. Create stronger linkages to peace-building and conflict-prevention agendas, recognizing that unmanaged water bankruptcy can exacerbate internal and transboundary tensions, while cooperative, bankruptcy-aware water governance can serve as an entry point for peace, confidence-building and regional cooperation. The Conferences should call for stronger legal, regulatory, monitoring and multilateral frameworks for shared waters and more effective conflict-resolution mechanisms, so that disputes over declining and degrading water resources are handled through joint institutions rather than escalation.

VII. Mobilize and align investments for managing water bankruptcy and supporting just transitions, by encouraging the creation and expansion of dedicated global and regional water funds and by significantly increasing the share of existing climate, biodiversity, and land degradation neutrality finance that is explicitly directed to water-related actions. These investments should prioritize measures that reduce over-extraction, restore degraded water-related ecosystems, strengthen the resilience of vulnerable communities, and systematically integrate water considerations into broader investment and development planning, so that "investments for water" are recognized as investments in climate stability, biodiversity, land restoration, food security and peace.

These measures can turn the 2026 and 2028 UN Water Conferences into historic milestones in the transition from a crisis narrative to a bankruptcy narrative: from asking how to avoid a future global water crisis to avoid a future global water crisis to asking how to live within degraded hydrological limits, prevent further irreversible damage, and use water to reinvigorate collective action on the wider environmental agenda.

PRIORITY AGENDA FOR THE 2026 AND 2028 UN WATER CONFERENCES

Recognize that a new global water agenda is needed. Acknowledge that many basins and aquifers have moved beyond reversible stress and crisis, and that the current global water agenda, focused primarily on WASH, incremental efficiency gains, and generic IWRM prescriptions, is no longer sufficient. Call for the development of a new global water agenda aligned with the Anthropocene water realities and elevated within the wider UN policy architecture.

Embed Global Water Bankruptcy in political declarations and commitments. Explicitly recognize Global Water Bankruptcy in conference outcome documents, making clear that past hydrological and ecological baselines cannot be fully restored in many systems, and that governance must adapt to permanently tighter and degraded conditions. Stress that delaying the recognition of insolvency and irreversibility will only deepen environmental degradation and increase economic, social, and geopolitical costs.

Mandate a Global Water Bankruptcy monitoring framework. Request the development of a standard framework to track total water storage, groundwater depletion, loss of wetlands and glaciers, water quality degradation, and key markers of irreversibility and claim–capacity mismatch, making full use of Earth observation, satellite technologies, AI, and integrated modeling.

Pledge to support national and basin-level diagnostics and just transitions. Commit to helping countries and basins diagnose whether their systems are in stress, crisis, or bankruptcy, and to designing mitigation and adaptation pathways that bring demands back within degraded carrying capacities, combining technological solutions with policy, legal, and institutional reforms, and ensuring fair burden-sharing and social protection.

Position water as an opportunity sector for the Rio Conventions and SDGs. Highlight how investments in addressing water bankruptcy—protecting and restoring freshwater ecosystems, reducing overuse, improving land and soil management, and enhancing water security—directly support climate mitigation and adaptation, biodiversity conservation, land-degradation neutrality and SDG 6, and can help break negotiation deadlocks across the Rio Conventions and related processes.

Strengthen links with peace-building and conflict prevention. Recognize unmanaged water bankruptcy as a driver of internal and transboundary tensions, and promote cooperative, bankruptcy-aware water governance as an entry point for peace, confidence-building, and regional cooperation. Call for stronger legal, regulatory, monitoring, and multilateral frameworks for shared rivers and aquifers, and more effective conflict resolution mechanisms so that disputes over declining and degrading resources are managed through joint institutions rather than escalation.

Mobilize and align finance for managing water bankruptcy and supporting just transitions. Encourage the creation and expansion of dedicated global and regional water funds, and a significant increase in the share of existing climate, biodiversity, and land finance explicitly directed to water-related actions that reduce over-extraction, restore degraded water-related ecosystems, strengthen the resilience of vulnerable communities, and integrate water into wider investment and development planning.

5.6 Conclusion—A New Water Agenda for the Anthropocene

This UNU-INWEH report has argued that the world is already living beyond its hydrological means. Many human–water systems have moved from stress to crisis and into water bankruptcy: a persistent post-crisis state in which long-term water use has exceeded renewable inflows and safe depletion limits, and in which irreversible or effectively irreversible damages make full restoration of the old baselines and past conditions unattainable.

Recognizing this reality is uncomfortable, but it is also empowering. It replaces false hope of a simple return to the old normal with a clear-eyed understanding of the choices that remain. It shifts the focus from reacting to each new drought, flood, or Day Zero as if it were an isolated emergency, to transforming the underlying relationships between societies and water.

The way forward is not to abandon mitigation or crisis preparedness, but to embed them within a broader project of bankruptcy management: preventing further irreversible damage; protecting the hydrological cycle and water-related natural capital; rebalancing rights, claims, and expectations; transforming water-intensive sectors and development models; protecting the most vulnerable; and aligning economic and political incentives with degraded hydrological realities.

In doing so, **water can serve as a bridge rather than a fault line**. Within countries, bankruptcy-aware water governance can help reduce tensions between urban and rural areas, between environmental and agricultural constituencies, and between different political camps. When farmers and rural communities are supported through fair allocations, just transitions, and credible long-term plans—rather than being asked to bear the costs of adjustment alone—water policy can move from being a source of resentment to a platform for negotiated compromise and shared purpose.

At the international level, **a Global Water Bankruptcy agenda foregrounds shared vulnerability while recognizing differentiated responsibilities and capacities**. Investments in water security, particularly in overdrawn basins and aquifers, are also investments in climate mitigation and adaptation, biodiversity protection, food security, and peace. Recognizing this creates space for more honest discussions about trade, finance, and technology transfer that support water-bankrupt and near-water-bankrupt societies without locking them into new dependency or further overshoot. **For transboundary rivers and aquifers, acknowledging bankruptcy calls for strengthening and reinterpreting legal and institutional frameworks** in light of non-stationary and changing hydrological realities, and for deeper cooperation on monitoring, data sharing, joint planning, and dispute resolution.

For the United Nations system, UN-Water members and partners, Member States and other actors, this means **embracing Global Water Bankruptcy not as a slogan, but as a diagnostic and governance framework.** It means integrating the reality of post-crisis human–water systems into climate, biodiversity, and land agendas; into SDG implementation and debt discussions; and into peace-building and humanitarian efforts. It also means recognizing that the current global water agenda, which is focused primarily on WASH, incremental efficiency improvements and generic IWRM prescriptions, **is no longer sufficient** to address the structural overshoot, irreversibility, and conflict risks that define water in the Anthropocene.

A new water agenda is needed—one that starts from the realities of water bankruptcy, acknowledges both local and global responsibilities, and aligns national and global priorities rather than setting them against one another. The converging global milestones, including the conclusion of the International Decade for Action "Water for Sustainable Development" in 2028, the United Nations Water Conferences planned for 2026 and 2028, and the 2030 deadline for SDG 6 and the 2030 Agenda more broadly, provide a rare opportunity to anchor this agenda: to recognize Global Water Bankruptcy openly, to realign climate, biodiversity, land, and trade processes around the realities of post-crisis human–water systems, and to **use water as a practical pathway for rebuilding trust and cooperation across divided societies and a fragmented world.**

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MEDIA HIGHLIGHTS

This report declares that the world has already entered the era of Global Water Bankruptcy. This is not a distant threat but a present reality: many human–water systems are now in a post-crisis failure state where past baselines can no longer be restored.

Global Water Bankruptcy is defined as a persistent post-crisis state of failure. In this state, long-term water use and pollution have exceeded renewable inflows and safe depletion limits, and key parts of the water system can no longer realistically be brought back to previous levels of supply and ecosystem function.

"Water stress" and "water crisis" are no longer sufficient descriptions of the world's new water realities. Many rivers, lakes, aquifers, wetlands and glaciers have been pushed beyond tipping points and cannot "bounce back" to past baselines, meaning that the language of temporary crisis is no longer accurate in many regions.

The global water cycle has moved beyond its safe planetary boundary. Together with climate, biodiversity, and land systems, freshwater has been pushed outside its safe operating space, reinforcing the diagnosis that the world is living beyond its hydrological means.

Billions of people are living with chronic water insecurity. Around 2.2 billion people still lack safely managed drinking water, 3.5 billion lack safely managed sanitation, and nearly 4 billion face severe water scarcity for at least one month each year. Almost three-quarters of the world's population live in countries classified as water-insecure or critically water-insecure.

Surface waters and wetlands are shrinking on a massive scale. More than half of the world's large lakes have lost water since the early 1990s, affecting about one-quarter of the global population that relies on them directly. Over the last five decades, humanity has lost roughly 410 million hectares of natural wetlands—almost the land area of the European Union—including about 177 million hectares of inland marshes and swamps, roughly the size of Libya or seven times the area of the United Kingdom. The loss of ecosystem services from these wetlands is valued at over US$5.1 trillion, similar to the combined GDP of around 135 of the world's poorest countries.

Groundwater depletion and land subsidence show that hidden reserves are being exhausted. Around 70% of the world's major aquifers show long-term declines, while land subsidence linked to groundwater over-pumping now affects more than 6 million square kilometers (almost 5% of the global land area) and nearly 2 billion people, permanently reducing storage and increasing flood risk in many cities, deltas and coastal zones.

Water quality degradation further reduces "usable" water and accelerates bankruptcy. Growing loads of untreated wastewater, agricultural runoff, industrial pollution, and salinization are degrading rivers, lakes and aquifers, shrinking the fraction of water that is

The cryosphere is melting, eroding a critical long-term water buffer. Since 1970, the world has already lost more than 30% of its glacier mass in several locations; some mountain ranges risk losing functional glaciers within decades, undermining water security for hundreds of millions who depend on glacier- and snowmelt-fed rivers.

Farmers and food systems are at the center of Global Water Bankruptcy. Roughly 70% of global freshwater withdrawals are used for agriculture, much of it in the Global South, and groundwater provides about 50% of domestic water use and over 40% of irrigation water worldwide—meaning that both drinking water and food production now depend heavily on aquifers that are being depleted faster than they can recharge.

Global food production is increasingly exposed to water decline and degradation. About 3 billion people and more than half of global food production are concentrated in areas where total water storage is already declining or unstable. More than 170 million hectares of irrigated cropland—about the combined land area of France, Spain, Germany and Italy—are under high or very high water stress. Salinization has degraded roughly 82 million hectares of rainfed cropland and 24 million hectares of irrigated cropland, eroding yields in key breadbaskets.

Drought impacts are increasingly human-made and extremely costly. Drought impacts, driven increasingly by anthropogenic drought (human-made water deficits due to overuse and degradation), already cost around US$307 billion per year—more than the annual GDP of almost three-quarters of UN Member States.

Global Water Bankruptcy is also a justice, security and political economy challenge. Without a deliberate focus on equity, the costs of adjustment will fall disproportionately on farmers, rural communities, Indigenous Peoples, informal urban residents, women, youth and other vulnerable groups, increasing the risk of social unrest and conflict.

Governments need to urgently shift from crisis management to bankruptcy management. The report calls for an urgent transition from short-term emergency responses to a deliberate strategy that prevents further irreversible damage, reduces and reallocates demand, transforms water-intensive sectors, tackles illegal withdrawals and pollution, and ensures just transitions for those whose livelihoods must change.

The current global water agenda is no longer fit for the Anthropocene. A narrow focus on drinking water, sanitation (WASH) and incremental efficiency improvements will not be sufficient to resolve escalating water risks and will increasingly compromise progress on climate, biodiversity, land, food security, and peace.

Water can be a bridge in a fragmented world. Because every country, sector and community depends on water, investing in managing water bankruptcy is also an investment in climate stability, biodiversity protection, land restoration, food security, employment and peace—offering common ground for cooperation between North and South and across political divides within nations.

World leaders are urged to use upcoming UN water milestones as turning points. The report calls on governments and the UN system to use the 2026 and 2028 UN Water Conferences, the end of the Water Action Decade in 2028, and the 2030 SDG deadline to reset the global water agenda, explicitly recognize Global Water Bankruptcy, mandate monitoring and diagnostics, and position water as a bridge for peace, climate action, biodiversity protection, and food security in an increasingly fragmented world.

About UNU-INWEH

The United Nations University Institute for Water, Environment and Health (UNU-INWEH) is one of 13 institutions that make up the United Nations University (UNU), the academic arm of the United Nations. Known as 'The UN's Think Tank on Water', UNU-INWEH addresses critical water, environmental, and health challenges around the world. Through research, training, capacity development, and knowledge dissemination, the institute contributes to solving pressing global sustainability and human security issues of concern to the UN and its Member States. Headquartered in Richmond Hill, Ontario, UNU-INWEH has been hosted and supported by the Government of Canada since 1996. With a global mandate and extensive partnerships across UN entities, international organizations, and governments, UNU-INWEH operates through its UNU Hubs in Calgary, Hamburg, New York, Lund, and Pretoria, and an international network of affiliates.

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