

1. Introduction: Transforming the world's understanding of the economics of water

Water moves around the globe in a complex and often invisible manner known as the hydrological cycle. Life, as we know it, relies on this cycle and impacts it at the same time. As this report explains, the world faces unprecedented changes to precipitation – the source of freshwater – with consequences for local and global well-being, today and for all generations to come.

A narrow view of the scale and scope of water, its connection across livelihoods and with each of the Earth’s ecosystems, has resulted in economic systems and incentives that misalign with the true and multiple values of water, which cultures and societies around the world have held for generations. The failure to acknowledge the economic, environmental, and societal contributions of water remains a significant obstacle to local and global progress, including realising the United Nations (UN) Sustainable Development Goals (SDGs) and ambitions to mitigate climate change.

The Global Commission on the Economics of Water (GCEW) calls for bolder thinking and more integrated policy frameworks locally and globally. We seek in this report to advance a new economics of water:

- One that recognises the hydrological cycle as a global common good, understanding that it connects countries and regions through both the water that we see and atmospheric moisture flows; that

it is deeply interconnected with climate change and the loss of biodiversity with each rebounding on the other; and that impacts virtually all the SDGs.

- One that transforms water governance at every scale, from local to river basin to global, to ensure it is managed more efficiently, delivers access and justice for all, and sustains the Earth’s ecosystems.
- One that brings together fundamental economic concepts and tools, most critically to value water properly to reflect its scarcity and the multiple benefits it provides as the Earth’s most precious resource.
- One that tackles externalities caused by the misuse and pollution of water but shifts from fixing them after the fact to shaping economies so that water is used efficiently, equitably, and sustainably from the start.
- One that spurs a wave of innovations, capacity-building and investments, evaluating them not in terms of short-run costs and benefits but for how they can catalyse long-run, economy wide benefits and hence dynamic efficiency gains through learning, scale economies and cost reductions.

- One that recognises that the costs entailed in these actions are very small in comparison to the harm that continued inaction will inflict on economies and humanity.

The GCEW set out to recast the economics of water, mapping the systemic links of the hydrological cycle to land, climate change, biodiversity loss, and progress on the SDGs. This report explores and proposes how we can re-define and re-value water as a critical planetary resource and manage the hydrological cycle locally and as a global common good. It highlights changes to the hydrological cycle, including the drivers of change, impacts, and consequences across scales and geographies. It provides the evidence and opportunities for systemic action to address the world's most important water missions and sets out the critical enablers required for these transformations.

The report follows two major reviews that spurred action across scales in response to climate change and the loss of biodiversity: the Stern Review on the Economics of Climate Change (2006), and the Dasgupta Review on the Economics of Biodiversity (2021). Both took on the challenge of re-imagining the way our economies interact with the climate and biodiversity, respectively, in the face of global environmental changes that pose significant risk to our well-being and way of life for generations to come. The Stern Review demonstrated the cost of failing to act on climate change and highlighted that the benefits of strong and early action far outweigh the economic costs of inaction. The Dasgupta Review offered a new framing for how we think about and measure success in our economies in a world where the biosphere is finite and provided a language for understanding our engagement with nature.

The economics of water is inseparable from the economics of climate change and biodiversity. This report builds on the approaches of both these preceding reviews, as well as a global engagement around the UN 2023 Water Conference and its follow-up actions. It shows that the cost of inaction on the water crisis and recent changes in the global hydrological cycle is high, but that action is possible – and unavoidable if the world is to continue to enjoy the myriad benefits water provides. The report demonstrates the bounds within which we operate when it comes to the stability and reliability of water sources and recognises the need to balance our demands with the ability of the hydrological cycle to supply them. Crucially, it recognises the need to value water as the essential resource it is: a systemic, irreplaceable source of life that underpins all human existence, the entirety of our natural assets, and economic activity.

Climate change and the loss of biodiversity are now considered critical global challenges and included in conversations beyond environmental circles. However, the water crisis and implications of a destabilised hydrological cycle for the shifts in the global environment, remains misunderstood or sidelined.

This report argues for water's central role in conversations around environmental change, governance, and economic decision-making at all levels. Its analyses build on previous international reports and existing international agreements that govern water resources. However, one of the report's fundamental conclusions is that the governance of water resources represents a much larger challenge than previously highlighted. It requires coordinated and integrated policies, across every economic sector, that connect to both climate

and biodiversity, with recognition of the broad set of water's function and services.

While the report presents an integrated assessment of water resources based on the latest evidence, it also recognises the work that remains to be done. It is unsurprising that much of the failure to address this challenge lies in the failure to use economic instruments appropriately and develop policy responses that address water's different economic aspects and avoid injustices. The report sets out the opportunity to improve the use of these tools to frame economic incentives in ways that purposely tackle the urgency and scale of the challenges at stake, reflect the changing hydrology and state of resources, ensure efficient water use in all sectors, shape equitable access and sustainable water uses, and safeguard water for nature and environmental processes.

The members of the GCEW have benefited from the work, analysis and expertise of dozens of researchers and the contribution of countless experts from around the world, and across sectors and backgrounds. The diversity of experience and knowledge on the Commission enabled valuable debate, allowing the GCEW to step out of the mainstream and to shape a new economics of water. As members of the GCEW participated in their independent capacities, the resulting report also does not reflect the views of any one institution or government. Indeed, the world's growing vulnerability to water risks will increasingly require collaborative processes such as this.

The report provides a strong foundational assessment of the physical changes in global water endowments and their economic consequences, why such changes have occurred, and how the water crisis and threats to the hydrological cycle can and must be addressed.

The report represents ways of thinking about economics, water and the hydrological cycle from across the GCEW, based on the best available science and economics, in a body of work that can continue to be built upon.

Until now, water has been governed and managed as if water resources are only local and steadily rechargeable year after year, factoring in only natural variability based on historical data. Chapter 2 presents evidence that this assumption no longer holds. We live in a world of more frequent and extreme water-related disturbances, and of life-supporting systems losing water resilience. We already feel the impact of an altered hydrological cycle and its interactions with atmospheric dynamics, with increasing frequency and severity of droughts and floods around the world.

The evidence presented in Chapter 2 highlights the need to recognise that the hydrological cycle comprises both "blue" and "green" water and must be managed as a global common good. Current approaches to water policy tend to deal with the blue water we can see – in rivers, lakes, and aquifers – largely overlooking green water – in soil, plants, and forests. Green water evaporates and transpires into the air, and recycles through the atmosphere, generating around half of all precipitation on land. These interdependencies take three main forms.

First, countries and communities are interdependent through the dynamics of the hydrological cycle at different scales. Water travels long distances: atmospheric moisture flows connect regions across borders, continents, and oceans in patterns that shift with the prevailing winds and rarely match the geographical complexity of surface water and

aquifer basins. The science of terrestrial moisture recycling helps us understand how local action – typically change to land use and natural habitats – can affect rainfall in other parts of a country or distant regions. Precipitation is determined by local actions not only where rain falls, but where it originates. The evidence in Chapter 2 shows that atmospheric moisture extends the scope of our understanding of how water moves. Managing water as a resource is much more than a local matter.

Second, the global hydrological cycle is deeply interlinked with the climate and biodiversity crises. Chapter 2 makes clear that we must redefine the relationship between water and climate. While the emphasis has always been on adaptation, the hydrological cycle is both impacted by and a compounding factor of the climate crisis. The stability of the water cycle is governed by Earth's energy balance and land use, determining the partitioning of precipitation in runoff and evapotranspiration. When green water is mismanaged and lost through deforestation and unsustainable land use, future precipitation is impacted and carbon storage is reduced in the soil and vegetation. Beyond climate change, the water crisis is deeply intertwined with biodiversity loss and desertification, both recognised as systemic and global issues. Droughts and floods exacerbate soil erosion and land degradation, which can create vicious cycles – ever-less-fertile soil that cannot support vegetation or absorb rainfall, more green water lost, and more land cleared to grow crops – inflicting damage on communities and all life. It follows that water should play a much more prominent role in national strategies to mitigate climate change and biodiversity loss.

Third, water plays a direct and indirect role in achieving all the SDGs, which are crucial for a thriving human species and global prosperity. Most economic activities and thus livelihoods depend on access to water. Globally, 80-90% of all blue water withdrawals are used for irrigation and 10% of freshwater withdrawals are used for urban purposes. Because water is essential to all the SDGs and the entire economy, the actions and choices made in a wide range of sectors affect water resources in profound ways often causing social injustices. Water is therefore not a sector that can be managed in isolation.

In a world of human-induced changes to resource dynamics, managing water as a global common good is an opportunity to mobilise collective action on a systemic and economy-wide basis. Without fully engaging people, communities, and countries in approaching the hydrological cycle as a global common good, water governance will fail to ensure the stability and integrity of this precious resource.

The economy is a thirsty system, and water is a critical economic input. The GCEW notes that policy incentives are seldom aligned with the economic, social, and environmental forms of value that water provides. Current systems for managing water resources are often not fit for purpose and have resulted in an unacceptably high human, environmental, and economic toll. The Earth system is therefore losing resilience: the ability to keep environmental and water conditions stable and conducive for human development. As demand increases, global populations rise, and climate change intensifies, the challenges will increase, requiring ever more urgent reforms and new policies.

Chapter 3 provides the foundations for a new economics of water. It highlights the forces driving the water crisis, from increased consumption to climate change and land-use shifts. It demonstrates how the intersection of changing water supplies and rising demand for water pose significant risks to human well-being and progress. New observational data, combined with new methods of analysis find that this is particularly true in countries that are water-dependent and where water scarcity is already a pressing issue, and reveals the stark consequences of inaction.

Aligning economic incentives to reflect the value generated by blue and green water provides a new perspective on how we govern and value water for the common good, combining economic efficiency, social equity, and environmental sustainability. Achieving any one of these outcomes requires achieving the other two as well. Placing these three objectives on equal footing represents a clear divergence from practices that came before, where environmental sustainability was considered a second order concern and equity subordinate to economic efficiency.

Achieving these objectives requires recognising the power of economic incentives to generate benefits from the use of water, address the risks that arise from water stress and correct externalities such as water pollution. The report also calls for complementary approaches that shift from a focus on fixing problems after the damage has been done, to avoiding problems from occurring in the first place. Prevention is typically more cost effective than the cure, which suggests the need to shape markets to use and allocate water more efficiently, equitably, and sustainably from the start.

The second half of the report looks at how to put this knowledge into practice, identifying the need for a significant shift in water governance. This shift is guided by three overarching priorities to support a new perspective on governing water:

- Value water for the essential services it provides. Water is rarely priced in ways that reflect its scarcity and contribution, and it is therefore used wastefully and seldom allocated to its most beneficial uses. Any policy regime would need to include safeguards to assure adequate access for poor households and environmentally sustainable and prudent uses.
- Absolute limits are critical to ensuring sustainability. Acknowledging that water systems are renewable, finite, and vital resources implies that there are absolute limits to the amount of blue and green water that can be safely and sustainably consumed.
- Policy packages can promote synergy. No single policy can achieve the multiple goals of efficiency, equity, and environmental sustainability. Policy packages will be needed to address the trade-offs likely to emerge.

Chapter 4 advances the economics of water with a view to responding to the 21st Century challenges that this report brings into focus. To ensure that these developments lead to the systemic, collective, and economy-wide action demanded by the global water crisis, they need to be underpinned by a new, less reactive, and more proactive economic framing. We must shift from fixing market externalities after the fact to shaping economies so that water is

allocated efficiently, equitably, and sustainably from the start. Indeed, markets across our economies – from agriculture and mining to energy and semiconductors – need to reshape their water use and impact on the hydrological cycle, including pollution, embedding outcomes-orientation and directionality.

The conception of states as market-fixers has led to the idea that governments are not supposed to steer the economy, only enable, regulate, and facilitate it. To tackle the global water crisis in an economy-wide way, this report proposes a mission-driven approach to policymaking, bringing multiple sectors together to tackle shared objectives. Missions are ambitious, clear, and time-bound objectives that mobilise cross-sectoral solutions to difficult challenges. They focus on outcomes, as opposed to outputs, and in doing so, missions can target challenges that do not necessarily have pre-defined, technological fixes. Solving these challenges therefore requires a bottom-up approach, exploring many possible solutions and mobilising economy-wide innovation, investment, and partnerships. This approach is adaptive, cross-sectoral, inclusive, and firmly committed to economic efficiency, justice and sustainability.

Part 2 considers what a mission-centred approach means for water and examines the policy levers that can be used to tackle the water crisis locally and globally. Chapter 5 identifies five critical water mission areas that must drive innovation in policies, institutions, and technologies to radically transform how water is used, supplied, and conserved:

- Launch a new revolution in food systems.
- Conserve and restore natural habitats critical to protect green water.
- Establish a circular water economy.
- Enable a clean-energy and AI-rich era with much lower water intensity.
- Ensure that no child dies from unsafe water by 2030.

Together, these missions address the most significant and interconnected challenges of the

3. The first two missions seek a transformation of policies and practices in agriculture and natural habitats, to conserve water whilst enhancing yields to feed a growing world population, and to redress the longstanding neglect of green water and stabilise the hydrological cycle. Recognising that the bulk of humanity live in urban areas where total water storage is unstable and declining, two further missions focus on promoting circular-economy solutions and reducing the water intensity of rapidly growing industries like clean energy and artificial intelligence (AI). Finally, we must never lose emphasis on the need to ensure access to clean water and sanitation for all.

The report sets out the critical enablers to successfully tackle these challenges in Chapters 6 through 10. Chapter 6 sets out how partnerships can be designed with equity, efficiency, and environmental sustainability at their core. Shaping markets requires starting with an objective, then designing property rights, partnerships and financial structures to deliver on that objective from the start, in a pre-distributive way. This requires a lot of attention to contract design and the form of partnerships between actors, especially between government business, which can become more symbiotic. A new approach to partnerships must be based on a new approach to risk: where risks are shared between actors, the rewards should be shared as well.

Finance can be shaped to support water policy ambitions, with benefits across agendas beyond water, at local, national, and global levels. In combination with blue water, attention should be paid to the green water part of the hydrological cycle in the context of climate-change mitigation and adaptation, biodiversity, and forest conservation. Chapter 7 looks at how finance can support mission-centred policy, including principles to mobilise and direct financing flows towards water stewardship and the policy shifts required across public, private, and multilateral finance.

Chapter 8 considers the governance of water utilities in the context set out by the GCEW. Cities need to become water-resilient and ensure access for all, through water-use efficiency, reuse, protection, and expansion of blue-green-grey infrastructure to address severe future water shortages and flooding, the growth of untreated wastewater, and climate-change-

induced impacts on the urban water cycle. It is imperative to reduce urban water consumption through demand assessment, management, and monitoring to ensure that public health, equitable and affordable water access, and ecosystem health are prioritised. The chapter sets out how water services and utilities can become mission-driven and water-justice-centric to support the missions set out in Chapter 5.

Data can help underpin the transformations needed. Chapter 9 sets out the data landscape, and the gaps and why they exist. It looks at how to unlock the potential of data that is comprehensive, high quality, timely, interoperable, and publicly accessible to face the five missions and achieve the principles set out in Chapter 3.

Finally, Chapter 10 makes the case for water to be considered as an organising principle for sustainable development, and the scaffolding to establish a global water governance mechanism to ensure a comprehensive strategy to deploy collective local to global action on water. The chapter explores the complexity of the challenges of water governance, and the role of international institutions in global water governance. While high-level leadership is necessary, it must be complemented by robust, participatory, and bottom-up approaches. Multiple perspectives must be brought to the table, including civil society groups, front-line communities, citizens and individual water users, and private sector actors.

The conclusion builds on all chapters of the report, to offer a suite of principles fit for current and future challenges. These principles, in line with the ambition of the GCEW, are set to address the water crisis and beyond, contributing to global agendas. These principles provide the basis for further discussion and refinement, as well as opportunities for action beyond the work of the Global Commission.

1. The hydrological cycle, encompassing both blue and green water, has to be governed as a global common good, through concerted action in every country and collaboration across boundaries and cultures.
2. There are absolute limits to the total amount of water that can be safely and sustainably consumed globally.

3. Water must be an organising principle for the transformations required to achieve collective ambitions on sustainable development, and global environmental ambitions, regarding climate change, biodiversity and desertification.
4. Economic efficiency, social equity, and environmental sustainability are mutually supportive. They can only be achieved through a range of policy packages, because no single policy alone can achieve the three of them.
5. Water must be priced, subsidies allocated, and regulations shaped to support both efficient water use and affordable access for all. Further, the full value of water's ecosystem benefits, including those deriving from green water, must be built into decisions on land use and protection of natural habitats.
6. We should also shift from fixing externalities after the fact to shaping economies, so that green and blue water is used efficiently, equitably, and sustainably from the start.
7. An outcomes-focused approach centred on our most important and interconnected water missions, must drive coordinated actions by governments, the private sector, and communities.
8. Every human being needs water for a dignified life, estimated at 4000 litres per person per day. This estimate needs to be refined, promoted and achieved.

