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Briefing Pack

Groundwater: Making the Invisible Visible

FCDO Briefing on Water Governance, Finance, and Climate Change

March 2022

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Introduction

Did you know that more people use groundwater for drinking than use rainwater or surface water and that **agriculture is responsible for 70% of global water withdrawal?** Groundwater is water found underground in aquifers which, although hidden from view, are vital to agriculture, economic growth, nature and health. Groundwater is an especially important source of water as rainfall varies due to Climate Change - see the latest **IPCC report** for more details. This briefing pack provides some of the latest evidence and information about groundwater. It also presents information on how the Climate and Environment Department at FCDO is tackling water security to reach two overarching goals:

- Tackle and reverse growing water insecurity and its consequences caused by depletion and degradation of natural water sources
- Address poor water management and increasing demand

In this pack we discuss the UK's Water action at COP26; programme activities around water and climate, water governance, finance, and gender and the UK's well-developed water 'offer', that together, can help reach the goal of global water security. Here you will find key facts, messages and videos,– all intended for colleagues invited to World Water Day events or wanting to engage in some water diplomacy! For more info please contact Andy Roby, CED Senior Water Security Adviser at FCDO.

All you need to know for World Water Day – 22 March 2022

World Water Day is an annual United Nations Observance, started in 1993, focusing on the importance of water.

World Water Day celebrates water and raises awareness of the 2 billion people living without access to safe water. A core focus of World Water Day is to support the achievement of Sustainable Development Goal (SDG) 6: **"Ensure availability and sustainable management of water and sanitation for all".**

In the lead-up to 22 March, people and organisations host World Water Day events and participate in the global public campaign, launched in the preceding months by **UN-Water** and social media.

On World Water Day itself, the ***UN World Water Development Report*** is released, focusing on the same topic as the campaign and recommending policy direction to decision-makers.

The theme for 2022 is **groundwater**, i.e. water found underground in aquifers – geological formations of rock, sand, and gravel that hold substantial quantities of water. Groundwater feeds springs, rivers, lakes, and wetlands, and seeps into oceans. Groundwater is recharged mainly from rain and snowfall infiltrating the ground and can be extracted to the surface by pumps and wells.

See the videos ***Introducing groundwater*** and ***Unlocking Africa's groundwater potential*** and a list of **ten reasons why groundwater is important** from UPGro – a UK-funded seven-year (2013–2020) social and natural science research programme for enabling sustainable use of groundwater for the benefit of the poor across sub-Saharan Africa.

See also the latest innovations and developments around groundwater (**Section 5**) from Alan MacDonald and Kirsty Upton, British Geological Survey.

In this pack we discuss the UK's Water action at COP26; programme activities around water and climate, water governance, finance, and gender and the UK's well-developed water 'offer', that together, can help reach the goal of global water security.

1 UK position on water

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Why is global water security important?

Shared water security is an essential accelerator for social and economic progress: getting girls into school, creating jobs and economic growth, enabling food security, climate resilience, clean energy, and mitigating conflict. Water is also vital to nature, just as nature is vital to water.

Water security is defined as: the reliable availability of an acceptable quantity and quality of water for production, livelihoods, health, and ecosystems, coupled with an acceptable level of risk from hazards including drought, flooding, pollution, and conflicts. See **Sink or Swim? Water security for growth and development.**

Water security is about:

- Equity and inclusion – water security for some must not come at the expense of water security for others;
- Controlling the spread of COVID-19 (read ***Water for the urban poor and COVID-19***);
- Preventing avoidable deaths of over 800,000 people in low-income countries each year;
- Addressing the biodiversity crisis and the climate emergency;
- Adaptation and resilience to intensifying cycles of drought and flood events;
- Reducing the **10% of global greenhouse gas emissions which come from the water sector**; and
- Contributing to peace and stability.

Water security is one of the most important yet often neglected global priorities that underpin the attainment of all the SDGs. Failure to act effectively will impose an incalculable human and ecological toll, and will constrain economic growth by as much as 6% a year by 2050.

Climate change and water

"The global water cycle is embedded in the global climate system. Most often, we view water narrowly and locally: *our* river or lake, *our* irrigation system, *our* flood levee, *our* cooling reservoir or wastewater treatment plant. The water cycle is far more, however, than the water we can see. It is a complex system that interconnects uses of water in rural communities, towns and cities with struggles for dignified lives, health and equality; that couples the energy, agricultural and industrial sectors with nature and the future survival of ecosystems; and that embeds risks from flows of water on land, below ground and in the atmosphere. Climate change is reconfiguring this water system. Accelerating evaporation, shifts in the seasonality of precipitation or rates of groundwater recharge, or changing risks of unexpected deluge are unravelling basic assumptions about how we manage water in agriculture and cities or for public health, rural livelihoods and nature conservation. But therein lies opportunity – through adaptation of water management, we can build resilience to climate change across these priorities." (**Smith & Matthews, 2019**).

Climate change will largely be experienced through water and 80–90% of climate adaptation is water-related. Water security is also crucial to life on earth. Some 2 billion people are short of water globally and this number is expected to rise as the weather changes. Investment now in water resilience will strengthen food and energy security, health and biodiversity outcomes, as well as stability and reducing conflict. The water sector contributes 10% of global greenhouse gas emissions, from wetlands through to wastewater gases, and adaptation in this sector will reduce emissions, especially through nature-based solutions (NbS) and water productivity. To hear more about the links between climate change and water, listen to the ***Medium of positive change: Activating climate and water*** talk by John Matthews (Alliance for Global Water Adaptation (AGWA)).

2 UK water offer

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The overarching goals for the UK in relation to global water security are to:

- Tackle and reverse growing water insecurity and its consequences caused by depletion and degradation of natural water sources; and
- Address poor water management and increasing demand.

To do this, the UK has a well-developed water "offer" that together can help reach the goal of global water security. This section provides details of that offer.

- **UK water leadership:** The UK developed the concept of modern sanitation and water supply, an early example being the **Victorian Bazalgette London sewer**.
- **Ownership and regulation:** The UK has four models of ownership: government department in Northern Ireland, GoCo in Scotland, Mutual in Wales, and private companies in England. But the common thread is strong and clear regulation to deliver the right outcomes for society.
- **Competition and markets:** The UK set up the world's first water retail markets for business customers, delivering savings and environmental benefits. Similar market mechanisms are being developed for sewage sludge, which will help drive circular economy solutions.
- **Innovation:** The UK has a huge number of water tech start-ups and most water companies have labs and pilot schemes to support these fledgling companies. At the same time, the English regulator, Ofwat, has established a large innovation fund, which along with the Scottish Hydro Nation initiative has made the UK the best place in the world for water innovation and tech.
- **Nature-based solutions (NbS):** The UK is developing NbS to tackle aquatic climate change impacts such as floods and droughts and is committed to catchment restoration, which will also absorb carbon. Many of the catchment-based projects are multi-partner, involving communities, businesses, utilities, NGOs, and government.
- **Blue-green infrastructure:** Work is underway to develop integrated blue-green infrastructure solutions. **Welsh Water's RainScape projects** are a great example of adapting urban landscapes to reduce run-off and mitigate against flooding. Scotland has a similar programme called **10,000 Raingardens for Scotland**, and the Environment Agency has published a **National Flood and Coastal Erosion Risk Management (FCERM) Strategy** to the year 2100.
- **Water resilience:** The UK is taking a lead in planning for a resilient future based on climate change predictions and growing/changing population. The Met Office, Defra, the Environment Agency, and others have together produced **models that can accurately predict UK weather in 40 years' time**. This is key to ensuring that the UK's water infrastructure can cope with the effects of the climate in the future. Initiatives that are linked in some way to the UK Climate Projections (UKCP18) – a climate analysis tool that forms part of the Met Office Hadley Centre Climate Programme – UKCP18 include **Twenty65** (what the UK water sector needs to look like in 2065) and **Net Zero 2030** (England's water utilities have committed to this sooner than any other industry).
- **Green funding:** Anglian Water and other water companies have innovated by developing green bonds as a financial vehicle for environmental enhancement. The government has also facilitated £2.7bn in funding for the water sector's green in England.
- **Affordability:** Water affordability is a key priority for the UK water sector. Both the economic regulators and the consumer protection bodies are able to scrutinise water company plans to ensure water prices are fair and that all companies have schemes to alleviate water poverty.
- **Net-zero carbon:** The UK's water sector was the first in the world to set a target (2030) for net-zero carbon. The innovations needed to achieve this are relevant globally.
- **Full cost recovery:** Investment programmes of billions of pounds are delivered each year, funded

through full cost recovery with no government subsidy. Water companies in England and Wales invested more than £8bn in 2019/20, part of a £44bn spending commitment for 2015–2020.

- **Continuous improvement:** The UK has low prices for delivering water and sanitation services, world-class tap water quality, and excellent environmental protection for the aquatic environment. But at the same time, consumer protection, water quality, environmental regulators, and NGOs push for improvements. The combined strength of civil society alongside regulation has led to the designation of inland waterways as bathing water, and in response to criticism from the press and public, water companies are addressing aquatic water quality. This is a journey and in the UK the water utilities sit within a wider water sector where NGOs, press, regulators, and the public all have a voice.
- **Water research:** The UK water sector also includes universities and research bodies such as the world leading **Centre for Ecology and Hydrology** and the **Water Research Centre**. Given the importance of water to both adaptation and mitigation, the government wants to strengthen the UK's research and development capabilities (**see GCRF**). This includes application and engagement; for example, the Camellia project – run by Imperial College London, University College London (UCL), and the University of Oxford, along with the British Geological Survey (BGS) – is focused on public engagement with water science, and is globally unique.
- **Public engagement:** Civil society structures and NGOs, along with the fora set up by water companies, ensure that there is wide-scale public engagement in decision-making in the water sector, in particular the investment priorities of the utilities. Some of the company financial KPIs reflect successful customer engagement.
- **Expert bodies and consultants:** The UK has a wide range of internationally recognised expertise on water: global consultants and engineering firms and specialist companies ranging from environmental economics to digital water solutions, and from large-scale infrastructure to nano materials. There is also a range of chartered institutions and trade bodies that regulate and promote learning and good practice in the sector alongside a number of training and qualification bodies. The UK also has globally recognised water quality and water efficiency standards. This expertise is promoted by bodies like **British Water**.
- **WASH:** Overseas aid provided by the UK government and by NGOs like WaterAid are globally recognised and deliver water, sanitation and hygiene (WASH) projects throughout the world. Britain also trains and educates water professionals from many countries through outreach programmes or directly at UK universities, or as a hybrid through Massive Open Online Courses (MOOCs) on water. British Investment International, the UK Government's development finance institution, aims to play a central part of the UK's offer to help developing and emerging countries meet their financing needs for climate-resilient and low-carbon water infrastructures to create sustainable and prosperous futures. It works with the private sector to deliver much needed climate-resilient infrastructure in the space.

UK water-related initiatives

- **The Taskforce on Climate-related Financial Disclosures (TCFD)** requires companies and investors to reduce their water footprint.
- **The Taskforce on Nature-related Financial Disclosures (TNFD)** will include water indicators.
- Defra and the Environment Agency have a modest international programme to share water policy and regulatory expertise internationally.
- **DIT has a well-developed international "offer" from the UK**, such as blending public and private finance, NbS, regulation and policy reform, and adaptation.
- The UK water industry has committed to the **Net Zero 2030 Routemap** and reporting, and is helping water utilities internationally raise their ambition as part of the Race to Zero and **Race to Resilience** through campaigns launched at COP26, such as **50 to 1 billion**.
- DIT is negotiating trade and investment agreements with developing countries that are aligned with the UK's water footprint and standards work.
- BEIS fund five Global Challenge Centres for Water from UK Research and Innovation e.g. **The Water Security and Sustainable Development Hub** – **see Section 10**.

What are the FCDO priority water programmes?

The Research and Evidence Division (RED) has invested heavily in building up significant knowledge resources and UK capacity in groundwater, climate, innovative technology, and urban household water security. Current programming is working to establish

strategic partnerships on climate adaptation under the Adaptation Research Alliance (ARA) to ensure climate policies draw on the best evidence and information available.

In addition, MENAD, Africa, and Asia regional climate programmes all include spend of £10–20m on transboundary water and will work with multilateral development banks on investment and NbS (especially Asia) over the next three to five years. Within Africa, the £33m **Climate Resilient Infrastructure Development Facility (CRIDF)** programme in 12 Southern African countries is using NbS. MENAD has a more country focus due to the extreme water scarcity issues linked to conflict and stability through a programme called PHENOMENAL (see Lord Goldsmith's announcement at World Water Forum).

Many FCDO country bilateral ODA programmes will include climate change given commitments made at COP26 and the new tranche of International Climate Finance (ICF). Although the ICF strategy and indicators are still in draft, water is likely to feature in view of its importance for adaptation and nature, and the UK's intention to increase the finance of both significantly.

Climate and Environment Department (CED) programme

CED is working up a new programme to tackle shortfalls in water availability due to population growth, urbanisation, industrialisation, and changing patterns of consumption – all of which are exacerbated by climate change. This programme will support implementation of the COP26 commitments and initiatives we supported on finance (**see Section 5**) climate policy (see **AGWA**) and, governance (**see Section 6**). More details will be published when the concept note in approved.

The CED programme will be global, with policy work on best practice, standards, regulations, and trade, complemented by direct action in around 10 countries. In increasing the UK sustainable water footprint, the programme will inform and encourage other consumer countries to do the same. It will enable water-scarce partner countries to access national and international expertise and best practice in support of their water security planning and policymaking.

What was the UK's role in water action at COP26?

The UK had a leading role at COP26 on water and the main deliverables are listed below.

Agreed use of the AGWA Water Tracker

Fifteen countries agreed to use the **AGWA Water Tracker**, a tool and diagnostic guide to strengthen water resilience in climate and national development planning.

"The very fact that water is so fundamental to life means responsibility is split between many different areas of individual governments. Policies can suffer from a lack of integration and are harder to fund as a result. The Water Tracker seeks to tackle those problems." – Alok Sharma, COP26 President

The Netherlands, UNFCCC, UNDP, UNICEF, SWA, and GWP are all partners in the AGWA Water Tracker.

Signing of the Glasgow Declaration for Fair Water Footprints

The UK led the development of the **Glasgow Declaration for Fair Water Footprints for Climate-Resilient, Inclusive, and Sustainable Development** (FWF Declaration) with seven other countries and 20 businesses, investors and civil society organisations. The FWF Declaration provides an exciting opportunity to reshape the political economy around water, and to put sustainable, equitable and resilient resource use at the centre of UK global trade and investment. It follows the **call to action from UK Minister Lord Goldsmith** in August 2021 to ensure responsible water use throughout our globalised supply chains, to protect nature and human rights, build resilience to climate shocks, and accelerate attainment of the global goals.

The FWF Declaration provides an exciting opportunity to reshape the political economy around water, and to put sustainable, equitable and resilient resource use at the centre of UK global trade and investment.

The only political commitment on water at COP26, the FWF Declaration committed businesses, governments, civil society, and investors to join a collaborative effort to transform how the global economy interacts with the water environment and the resilience of local communities. Requirements of signatories include to:

- Ensure zero pollution, sustainable withdrawal of water, universal WASH access, protection and promotion of nature, and planning for drought and floods throughout their supply chains by 2030;
- Build a community of learning, practice, and leadership;
- Proactively champion FWF and recruit others; and
- Adopt and apply water stewardship as the business norm.

The global production and consumption of food, clothes, and goods such as mobile phones, computers, and cars have a major influence on society's climate and water challenges, and their solutions. Our water footprints shape water and climate security for millions of people. As the climate emergency escalates, we have a once-in-a-generation opportunity to change the way we interact with water and to harness the power of our water footprints – as individuals, companies, and countries – to ensure that they drive fair, sustainable, and resilient water use by 2030 (**Water Witness**).

Read more about **the role of fair water footprints and water stewardship** here and in **Section 6**.

Resilient Water Accelerator at COP26

The Resilient Water Accelerator partnership including donors, beneficiary countries, banks, investors, and other organisations agreed an approach to attract private investment into the water sector.

The **Resilient Water Accelerator**, in partnership with national governments and local communities, will support country efforts to secure climate finance, ensuring that despite the many challenges they face,

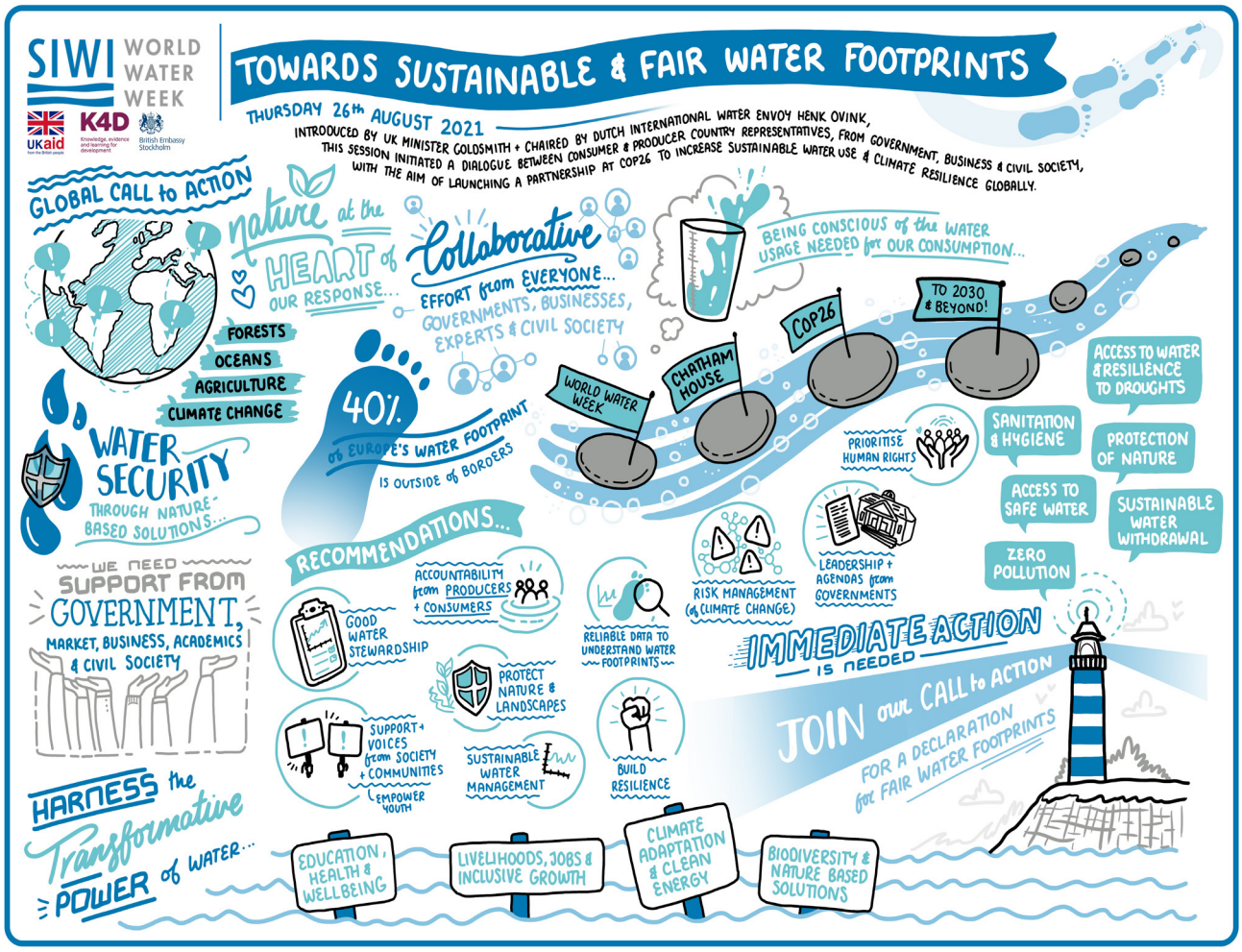


Illustration of a SIWI World Water Week event in August 2021.

Source: K4D. Available here: **https://www.ids.ac.uk/publications/the-journey-to-achieving-fair-water-footprints-for-climate-resilient-inclusive-and-sustainable-development/**

vulnerable people on the frontline of climate change will have reliable clean water "fit for the future". It has proven difficult to boost private investment in water, yet this is where most of the finance will come from to reach SDG 6 by 2030. The UK is working with other partners such as WaterAid and the Prince of Wales' Sustainable Markets Initiative to integrate lessons into the design of the Accelerator.

The World Bank, African Development Bank, Asian Development Bank, and British Investment International (formerly CDC) are partners in the Resilient Water Accelerator. The UK is working with these and other development banks to strengthen their approach to nature and climate. Read this **rapid review synthesis** of evidence on the innovations for water finance that could be applied to mainstream and expand NbS in developing countries. It also highlights some obstacles, opportunities, and potential synergies pertaining to water finance and NbS.

FCDO supported the Water Pavilion

At COP26, the **Water Pavilion** aimed to strengthen a unified voice on the role of water in meeting the goals of the Paris Agreement and support ambitious and science-based global climate action. It ran a full programme of events and seminars mirroring the **COP26 presidency programme**, and reached out to other "sector" constituencies at COP26 with a solutions-based approach. Egypt is thought likely to prioritise water at COP27, as will UAE at COP28, whilst the Netherlands and Tajikistan will co-host the **UN water conference** in March 2023.

3 Latest innovation and developments around groundwater

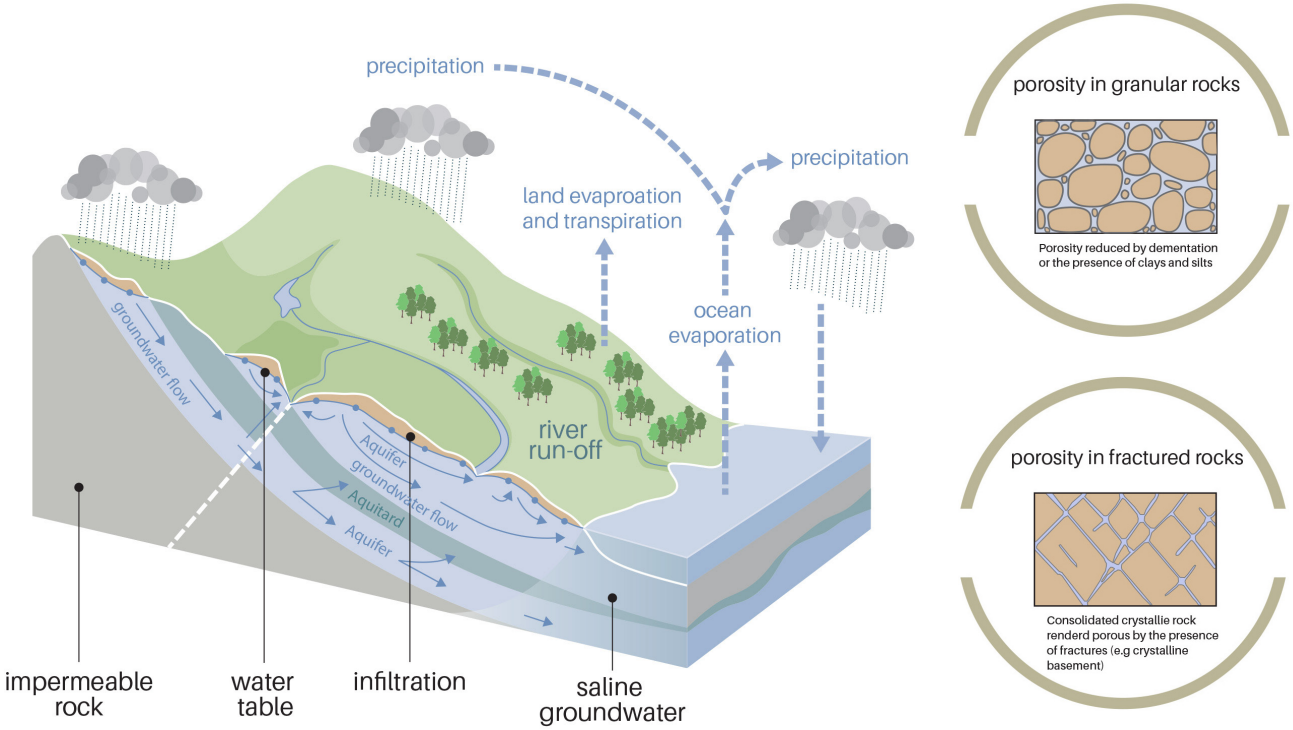
Alan MacDonald and Kirsty Upton, British Geological Survey

Groundwater is the largest store of unfrozen freshwater on the earth, approximately 20 times the volume of water stored in rivers, lakes, and reservoirs. Nearly half the world's population relies on groundwater for drinking water, and more than 900 cu km (25% of global water use) is pumped out every year for irrigation, industry, and drinking. Yet it is a seemingly mysterious resource, out of sight and poorly understood.

The distribution of groundwater is largely controlled by the geology, occurring naturally in the small pore spaces in sandstone, and in fractures in hard rocks like granite (see Figure 1). Most groundwater is replenished by excess rainfall that is not taken up by plants, which infiltrates more deeply to accumulate in the available pore spaces within the rocks. Naturally, this groundwater flows slowly over years, decades, and even millennia to discharge to springs, rivers, and wetlands – providing the baseflow through dry seasons and drought. Groundwater is often of good natural quality, free from bacteria, and contains salts that are generally (but not always) beneficial to health.

Despite the large global volumes of groundwater, it is a vulnerable resource. As schemes are developed to pump out huge quantities of water, and with the advent of particularly persistent contaminants, the resource needs to be protected and managed.

Figure 1. Groundwater's place in the hydrological cycle, and how it occurs in granular rocks like sandstone and fractured rocks like granite.



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The COP26 Presidency Glasgow Imperative: Closing the Adaptation Gap and Responding to Climate Impacts

The five pillars of the UK COP26 Presidency Glasgow Imperative: Closing the Adaptation Gap and Responding to Climate Impacts are: (i) building resilience across all of society; (ii) effective risk management; (iii) transforming finance; (iv) catalysing locally led action; and (v) harnessing the power of nature. Groundwater is key to helping deliver several of these pillars.

Access to groundwater helps build resilience. Groundwater responds much more slowly to changes in the climate than rainfall or surface water, and its natural storage provides a buffer to short-term variations in rainfall. Therefore, groundwater is often a reliable source of water during even prolonged droughts. Research led by UK scientists with researchers from Addis Ababa University showed that rural communities in remote parts of Ethiopia were much more resilient during drought if they had access to a community borehole that tapped groundwater. Countless examples around the world also demonstrate that tapping groundwater for irrigation or industry provides a reliable source of water, reducing the reliance on annual rainfall and helping to reduce the risk of investment. There are limits, however, and pumping out too much groundwater in the long term can lead to falling water tables or a decrease in water quality.

Groundwater is a local resource and lends itself to community-led adoption. By its nature, groundwater is a distributed resource, occurring in the rocks beneath our feet. Although some rocks are much better at holding and transmitting groundwater, it is generally possible, with the right expertise, to find some groundwater located close to the point of need. Small-scale water supplies can therefore often be developed locally and incrementally as demand increases. There are still challenges in managing groundwater resources locally, since users with deeper wells and larger pumps can affect the supply to other users.

Groundwater stored naturally in aquifers is a freshwater resource several orders of magnitude greater than storage in conventional reservoirs. Accessing groundwater does not require constructing expensive dams and large-scale engineering is rarely needed if aquifers are close to the areas of high demand. In many contexts, groundwater also supports rivers and vital ecosystems on which communities depend for their food and livelihoods. Such ecosystems are often sustained by groundwater during dry seasons and droughts, thus providing an important NbS for increasing community resilience to long-term climate trends and impacts, without the need for large-scale, expensive infrastructure.

SDG 6 strives for universal access to safe and affordable drinking water as a fundamental human right, while also aiming for sustainable use, protection, and integrated management of freshwater resources. In 2020, approximately one in four people still lacked access to safe water in their homes. In the context of population growth and climate change, this presents a significant global challenge, but is essential to support outcomes across the development agenda, including health, education, food security and livelihoods, gender equality, biodiversity, sustainable urban and industrial development, and economic growth. Increasing access to groundwater is one of the few realistic ways to achieve SDG 6 in many parts of the world, particularly in remote, off-grid locations. For example, the majority of improved water services in rural Africa are based on groundwater.

Debates and innovations in relation to groundwater

The current questions surrounding groundwater address how groundwater can be used sustainably to support societal needs and economic development while being protected from overexploitation and contamination so that its benefits can continue to be realised.

Unlocking the potential of groundwater. With the relevant methods and expertise, groundwater can help achieve universal and equitable access to resilient and safely managed water services in areas that are generally water insecure for part of the year. The SDGs require many more people to be supplied with larger volumes of domestic water, and food security will be achieved in many areas only through increased irrigation. New research is focused on trying to map out the 3D geology of aquifers to find where potential for groundwater is greatest, and to develop wells, boreholes, and pumps that are easily maintained and carbon neutral.

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Sustainability. There is much debate about what level of groundwater abstraction is sustainable. Groundwater and surface water are essentially one water resource and most groundwater pumping will eventually lead to reductions in baseflows to nearby rivers or wetlands. However, there are huge global differences, with most sub-Saharan countries taking out less than 5% of their annual renewable groundwater, while in South Asia and in parts of the US groundwater abstraction can far exceed the annual renewable rate, leading to large-scale depletion. Innovations in monitoring groundwater, both with in situ sensors and from satellites, can provide a good picture of the current state of the resource and recent trends.

Contamination. Groundwater can be vulnerable to pollution: excess fertilisers and pesticides from intensive agriculture can leach into it, and poorly regulated industry can lead to a cocktail of toxic chemicals soaking through the soil to contaminate it. Since groundwater moves so slowly, contamination can persist for many years and is difficult to remediate. The pollution of groundwater from poorly managed sanitation is also a huge problem in many rapidly developing cities where sewerage infrastructure cannot keep up, and even in rural areas if latrines are located too close to boreholes. New monitoring techniques are enabling contaminants to be rapidly detected, and although treatment is a last resort, there are increasingly effective methods using membrane technology and bioactive sand to treat water supplies.

Impacts of climate change on groundwater. Climate change is making rainfall less predictable across the world, with changes to the timing of rainy seasons and fewer rainfall days but higher rainfall intensity. However, this may not translate into less groundwater recharge. Our improved understanding of aquifer recharge suggests that groundwater levels respond to more intense rainfall and are more resilient than previously thought. Therefore, aquifers will become an increasingly important buffer against a more challenging and variable climate.

Groundwater is nature's reservoir and using groundwater storage can help reduce the requirement for surface water dams. There are existing examples with an ambition to **increase the use of nature to promote groundwater recharge**, and store water in the headwaters of catchments to help reduce the impacts of floods. These solutions may involve planting trees, changing agricultural practice to reduce tillage, building small dams to spread river water onto aquifers, and terracing slopes. However, the little research that has been undertaken suggests that careful selection of the type and location of the intervention along with incentives for farmers is paramount.

Figure 2. Some of the local challenges encountered when developing groundwater.
Local variation in geology, falling water tables if too much is abstracted, and pollution from persistent contaminants. The different challenges and opportunities relating to groundwater are well illustrated by the differing situations in rural sub-Saharan Africa and South Asia.

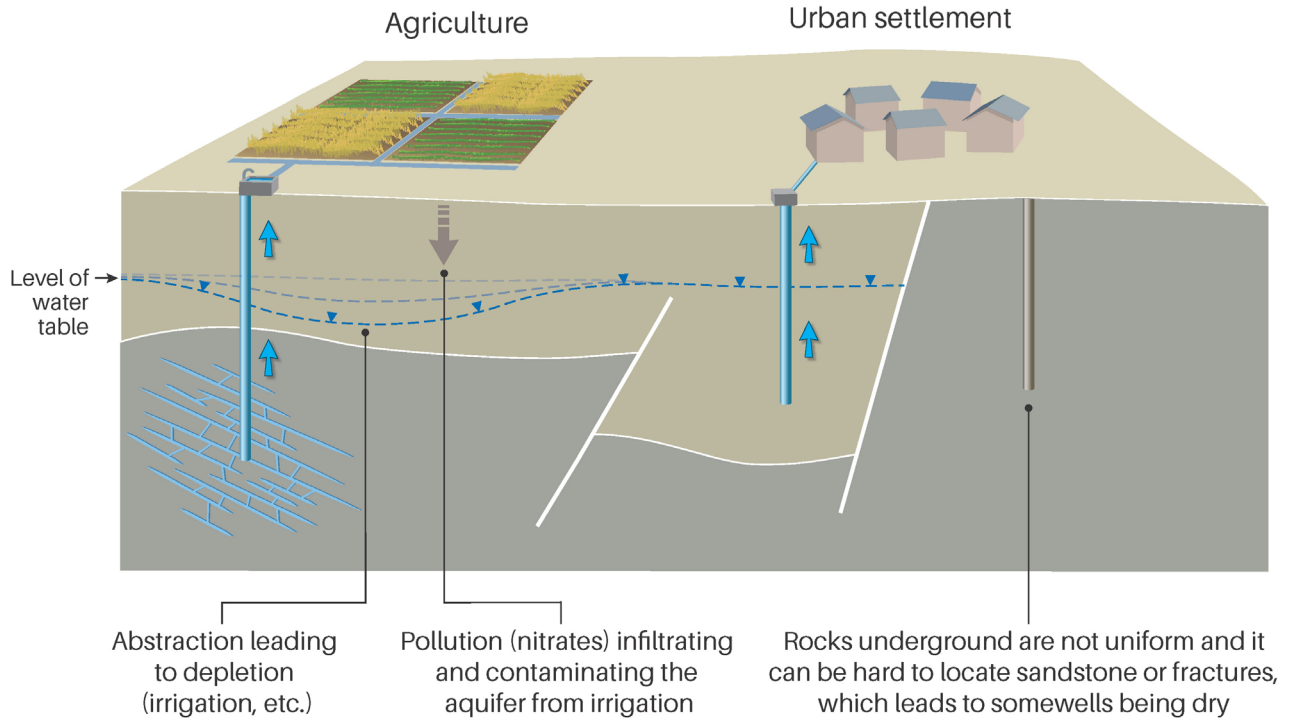

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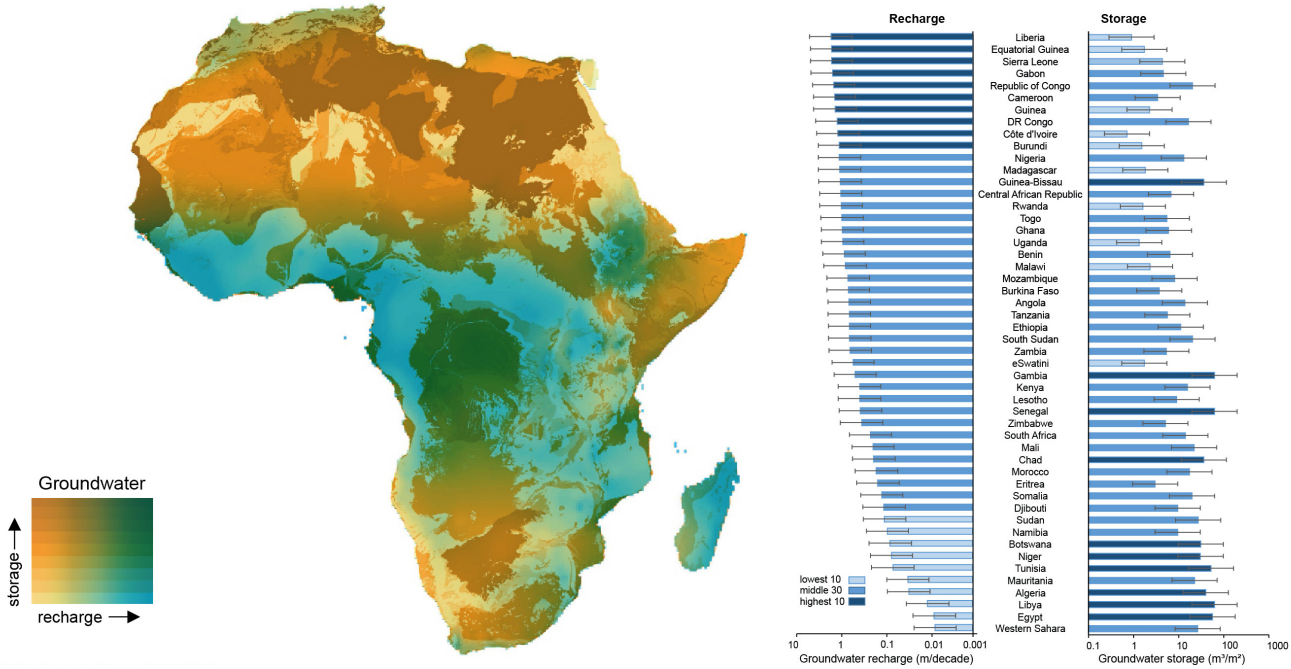
Figure 3. Groundwater storage and current recharge across Africa.

Countries with low storage tend to have high recharge, and even low-storage countries generally have sufficient groundwater stored to cope with several years of drought (MacDonald et al., 2021).



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Sub-Saharan Africa – untapped potential

Many countries and people in sub-Saharan Africa are water insecure, with most countries having more than 25% of the population without access to even basic water service and in some (such as Ethiopia, Niger, and Chad), more than 50% lack access to water (JMP, 2021). From the mapping of available groundwater resources, it is clear that in most places there is sufficient groundwater to sustain the yields of at least a handpump (0.2 litres per second) – with the right expertise to site and construct boreholes. Across all countries south of the Sahara there is also sufficient recharge to sustainably supply everyone with drinking water, and storage to sustain supplies through several years of drought (Figure 3).

The main challenge to realising the potential of groundwater is investment in methods and expertise to find, develop, and manage groundwater resources and infrastructure. Research by the FCDO/UKRI-funded UPGro programme in Ethiopia, Malawi, and Uganda showed that half of boreholes equipped with handpumps were not functioning as they should. The reasons were complex, related to poor siting of boreholes, poor quality of materials, and not enough emphasis on regular maintenance. Where water supplies were subject to regular maintenance, communities were much more likely to be water secure through times of drought (MacAllister et al., 2020).

Figure 4. The potential for groundwater in Africa to supply each person with 130 litres per day.

Based on analysis using existing data.

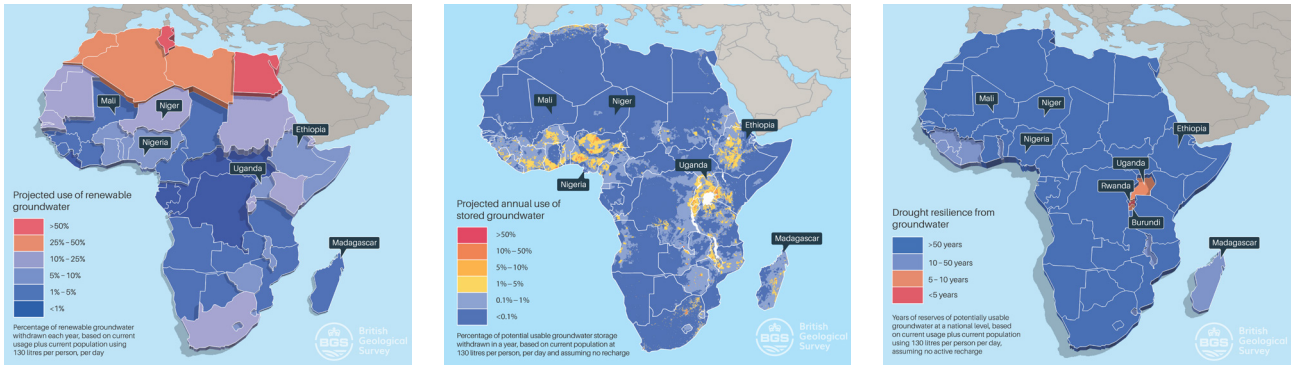

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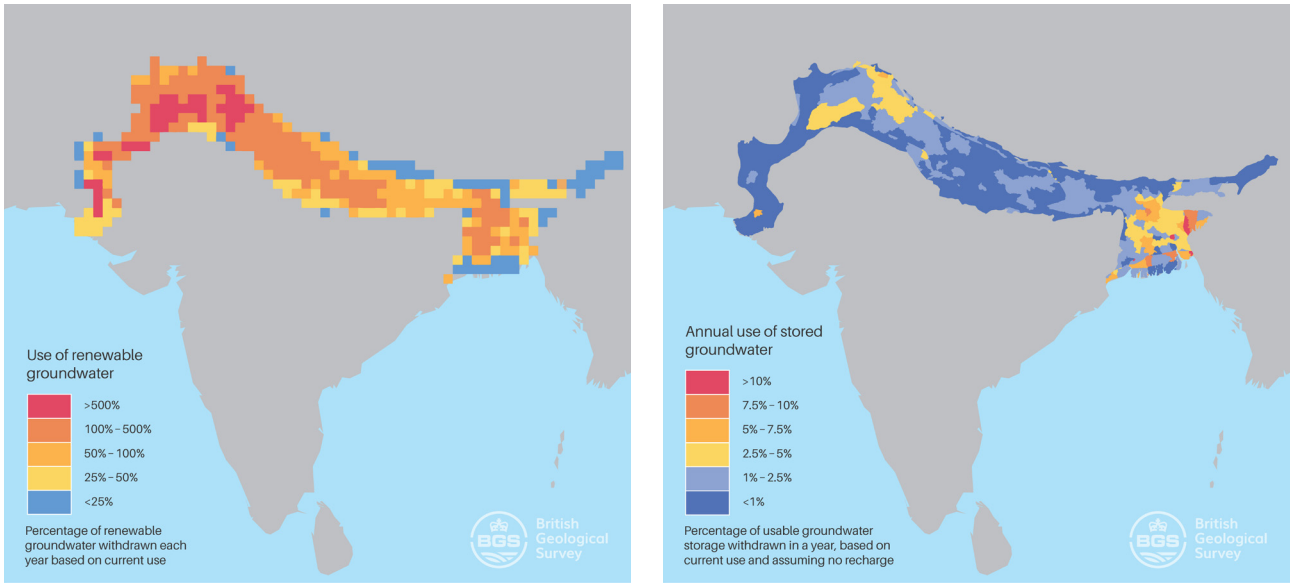
Figure 5. The stress on groundwater across the productive Indo-Gangetic aquifer.
For much of the aquifer more groundwater is abstracted than is naturally recharged.



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South Asia

In contrast to sub-Saharan Africa, groundwater has been extensively developed across much of South Asia, and particularly in parts of India, Pakistan, and Bangladesh, which are underlain by extensive highly productive aquifers. Abstraction from South Asia's aquifers comprises approximately half of global groundwater abstraction and in places is much greater than the annual rate of renewal (Figure 5). Widespread development of groundwater, particularly in the fertile Indo-Gangetic Plain, helped fuel the Green Revolution with the consequent substantial economic and social benefits. Development of groundwater use enabled farmers to have control over their irrigation, and led to double and triple cropping.

However, this extensive and largely unregulated groundwater abstraction has had some unintended consequences. Groundwater levels are falling in some areas, resulting in higher pumping costs and excluding farmers with shallower wells. Cities dependent on groundwater, such as Dhaka and Delhi, have experienced particularly rapid groundwater level decline. Groundwater pumping forms approximately 7% of all India's CO2 emissions. The high rate of irrigation has also exacerbated the rate at which soil and shallow groundwater is becoming saline and therefore of less value. The greatest humanitarian challenge is the presence of arsenic in shallow groundwater pumped across much of Bangladesh and West Bengal. When this was discovered, millions of people were already suffering from arsenic poisoning. Decades of research has uncovered the extent and causes of the arsenic, and deeper groundwater has now found to be largely arsenic free and a priority for drinking water.

See Alan MacDonald's TEDx talk, ***Has Africa run out of water?***

4 Supported networks for knowledge, connection, and opportunities

FCDO

- **Rural Water Supply Network (RWSN)** is a global network of rural water supply professionals and organisations committed to improving their knowledge, competence, and professionalism. RWSN aims to ensure groundwater resources are properly assessed and sustainably developed and managed for drinking water supply and other uses, ensuring their long-term quality and security.
- **AMCOW Pan-African Groundwater Program (APAGroP)** is a partnership of stakeholders representing member states, regional economic communities (RECs), river basin organisations, international and African research and capacity development institutions, programmes, professional bodies, the private sector, and NGOs. It is funded by Sida and UKRI/GCRF and aims to achieve:
  - Increased awareness and political commitment to groundwater, with better representation of groundwater in water policies and major water-focused programmes at various levels across the continent;
  - Continental cooperation, knowledge sharing, and collective action between member states and partners to establish a pan-African community of best practice on groundwater;
  - Efficient linkages between the research community, practitioners, and policymakers to promote evidence-based decision-making on groundwater-related issues; and
  - Strengthened institutional and individual capacity to improve groundwater use, management, and governance in Africa.
- **Groundwater Solutions Initiative for Policy and Practice (GRIPP)** is a partnership, led by the International Water Management Institute (IWMI) to **strengthen, expand, and connect current groundwater initiatives**. It will support the Global Framework for Action developed by the Groundwater Governance Project funded by the Global Environment Facility (GEF) and implemented by the Food and Agriculture Organization of the United Nations (FAO) together with UNESCO's Intergovernmental Hydrological Programme (UNESCO-IHP), International Association of Hydrogeologists (IAH), and the World Bank. Building on IWMI's three decades of research, it will embed sustainable groundwater practices at the heart of natural resource management and the SDGs.

- **UPGro** is a recently completed seven-year (2013–2020) social and natural science research programme for enabling sustainable use of groundwater for the benefit of poor people across sub-Saharan Africa. On the UPGro website there are hundreds of peer-reviewed papers, dozens of reports, and more than a thousand presentations. Some useful resources are:
  - Groundwater **country profiles** of seven African countries.
  - Policy Brief – **"Urban domestic groundwater use in informal settlements in sub-Saharan Africa: A call to action"**.
  - Policy Brief – **"Sustainable rural water services for all in sub-Saharan Africa".**
  - **Africa Groundwater Atlas** – 787 references that have been georeferenced, with more being added.
- **REACH water security programme** is setting up "water security observatories" in Bangladesh, Ethiopia, and Kenya to implement in-depth interdisciplinary research on water security and poverty. The research focus is on linkages between drinking water supply, water for livelihoods, water for economic growth, and water ecosystem risks, looking at how water security risks impact poor women, men, girls, boys, and marginalised groups to inform better policies and practices that will benefit all of these groups.
- **International Association of Hydrogeologists (IAH)** is the worldwide organisation for groundwater resource planning, management, and protection, and has developed a **strategic overview series of key issues**.

5 Water as a strategic climate asset

John H. Matthews and Kelsey Harpham, Alliance for Global Water Adaptation (AGWA)

Water in a diplomatic, ODA, or policy perspective is typically viewed as a sector, such as for rural WASH or urban utilities. In a climate context, references are more often limited to its role as a hazard or threat, such as from more frequent or severe flooding and droughts. A more progressive approach views water as a way to help ensure that economies, communities, and ecosystems can adjust, thrive, and prosper in spite of climate change, and that resilient water management, investments, policies, and approaches can provide coherence and credibility across a wide range of sectors, governance levels, and domestic and international issues.

COP26 and water goals

COP26 was the first UNFCCC conference to prioritise adaptation and resilience in negotiations, as well as NbS for both climate mitigation and adaptation targets. Water is central to both domains. Both the Global Water Partnership (GWP) and UN-Water have argued that most negative impacts of climate change will be felt through the medium of water. More recently, groups such as AGWA have argued that water is also the most important medium for coherent, effective resilience solutions. From this perspective, explicitly seeing that shared water resources links sectors – energy, agriculture, cities, WASH, natural resource management, health care, transport, among others – can ensure that our priorities, trade-offs, and choices about water allocation and sharing ensure reliability, endurance, and equity. The greatest gap in this space is using the tools and language of water resilience to negotiate these trade-offs, which looks forward to emerging usage and allocation patterns and the uncertainties we have in how the water cycle will evolve under additional climate change. These trade-offs form the new essential water infrastructure we need for this century.

Current debates and innovations – the Water Tracker for National Climate Planning

The **Water Tracker for National Climate Planning** is one of these emerging tools, supported by UK and Dutch aid. The Water Tracker launched in 2021 through work with individual country climate planning staff in a handful of countries in LAC, Africa, and Asia. With AGWA, the national partners explore how water is embedded in, sometimes even hidden in, governance, investments, infrastructure systems, and national programmes in order to determine if there are potential synergies or conflicts that interact with climate change. The goal is that countries make trade-offs explicitly and mindfully, and that they view these water linkages as dynamic, requiring insight to ensure that national economic efforts are robust, flexible, credible, and effective as the climate continues to evolve. A second cohort of some 20 countries launched in 2022.

The relationship between NbS and resilience is important for the transition from COP26 held in Scotland to COP27 to be held in Egypt. NbS themselves are most often about water resources and freshwater and nearshore marine ecosystems, which provision the adaptation services we need in a shifting climate. Examples include programmes such as **Room for the River** in the Netherlands and Bangladesh, which allow rivers to spread out and widen into marshes during flood events rather than trying to channelise floodwaters and push them downstream. China has pursued comparable approaches through their sponge cities programme. And, of course, aquifers – and how we manage the withdrawal and recharge of groundwater – are one of the most valuable resources we have worldwide. Groundwater is perhaps the most important NbS we need to expand because of climate change. Aquifers can be as actively and effectively managed as surface reservoirs, purifying and storing water for years or decades, without the same environmental impacts that surface storage systems have caused.

Case studies: Malawi and Costa Rica

We have two case studies of the Water Tracker – Malawi and Costa Rica – with more to come soon. Through tools like the Water Tracker, we have seen significant changes in behaviour in a number of countries, both solid middle-income countries like Costa Rica and less-developed countries like Malawi and Bolivia. Typically, countries have their national climate planning documents (and staff) in isolation, often in a hydro-met or environment ministry. Their work may be quite independent and freestanding, without much connectivity to other ministries.

With the initial cohort of countries using the Water Tracker, we have observed a shift towards seeing references to the NDCs in other ministries (irrigation, energy, national delta plans or national development plans, health care, etc.), and stronger language around assessing and reducing water-related climate risks in line ministries. In many cases, this progress comes from helping NDC and other national climate experts and coordinators develop a water-centric worldview to climate risks and opportunities, and then become in turn a resource to other ministries as they begin to integrate these perspectives into their own sectoral work.

Our hope is that the second round of NDCs (for 2025) is more ambitious, credible, and robust, and – perhaps most important – that in-country projects become more resilient and positively embrace a water-centric approach to design, planning, and operations.

Key messages on water governance

- Freshwater resources, including rivers, lakes, glaciers, snowpacks, precipitation, and groundwater, are actively evolving in response to climate change. Many of these impacts are not easily or accurately predicted by climate models, and these uncertainties are a challenge to traditional approaches to managing water resources, infrastructure, and sectoral systems such as utilities, energy, health care, agriculture, cities, and ecosystems.
- Most countries (perhaps all!) do not manage water as a climate-dynamic or cross-sectoral resource, or one that is shared across political and administrative boundaries. Improving these qualities is often an area in which knowledge sharing, aid, and diplomacy can have a cost-effective impact.
- We can often see evidence of a movement towards resilience in water trade-offs and decision-making by seeing how water is negotiated and discussed between ministries and from national to subnational levels. Cross-referencing water in the NDCs with, say, water-sharing agreements with neighboring countries or in water-intensive ministries and in key national policy documents is also a good sign. Ideally, a finance ministry cares as much about water resilience as a strategic national approach as an environment ministry.

Key resources, networks, and event

Key links to other resources, networks, and events relevant to this section are:

- The Adaptation Action Coalition (AAC) **Water Tracker for National Climate Planning** and ***Watering the NDCs: National climate planning for 2020 and beyond***
- Background paper for the 2019 report of the Global Commission on Adaptation (GCA): ***Adaptation's thirst: Accelerating the convergence of water and climate action***
- United Nations Development Programme (UNDP) **Water interactions to consider for NDC enhancement**
- **The *ClimateReady* Podcast**
- The World Bank's **Decision Tree Framework**
- UNESCO's **Climate Risk Informed Decision Analysis (CRIDA)**
- **AGWA** network on water resilience practice and policy
- **NbS for NDCs and "deep resilience"**
- **UNFCCC Adaptation Academy for National Climate Focal Points**

Most countries do not manage water as a climate-dynamic or cross-sectoral resource, or one that is shared across political and administrative boundaries. Improving these qualities is often an area in which knowledge sharing, aid, and diplomacy can have a cost-effective impact.

6 Water governance

Nick Hepworth, Water Witness

Change is coming: Fair water footprints by 2030

COP26 saw a breakthrough moment for social justice and climate resilience in the global economy when 28 parties signed **the Glasgow Declaration for Fair Water Footprints for Climate-Resilient, Inclusive, and Sustainable Development (FWF Declaration)**. Development of the **FWF Declaration** was led by the governments of the UK, Finland, Malawi, Madagascar, Peru, Panama, and the Netherlands, together with the NGOs Water Witness, CDP, and the African Civil Society Network for Water. The FWF Declaration commits its signatories to transformative action to ensure: zero pollution; equitable and sustainable water withdrawal and use; universal access to safe WASH; protection and promotion of nature; and resilience to climate change in their supply chains by 2030.

Most of the water needed to produce food, clothing, and consumer goods for the global North is used in the global South. Where water footprints are based on sustainable water use, this virtual water trade is a force for progress – creating jobs, growth, and resilience to climate change and other shocks. Unsustainable water footprints (over 50% of the UK's footprint has been characterised as such) drive depletion of groundwater, vulnerability to climate change, ecosystem degradation, and ill-health and injustice – particularly for women. The connectivity provided by the water footprints of citizens, companies, and countries provides new opportunities and obligations to trigger positive change.

In response to these opportunities, governments, businesses, banks, and NGOs have already started the work of delivering on the FWF Declaration's ambitious targets. As well as delivering material change on the ground, they have committed to pool learning on the bottlenecks they face to target the collective action needed to reshape the political economy of water for a more equitable, resilient, and inclusive future. For example, they are working to drive improved due diligence for responsible water use and collective action for resilience through global financing, trade, and supplier contracts.

How does it link to the wider water agenda?

The FWF Declaration has been lauded for providing the clear leadership vision and ambition needed to accelerate delivery of the SDGs on water – and climate resilience – by 2030. It brings together some of the world's wealthiest economies with those most in need, and in transition. Banks, businesses, and the "mainstream" water and development community are working to forge the system change we all need for a water-secure future. The FWF Declaration offers the opportunity to unlock stagnating water governance processes, new forms of progressive financing, and multi-stakeholder collaboration, and to move "beyond aid" through a global accountability mechanism for fair water use.

Understanding water footprints

Building on Tony Allan's (Allan 2011) landmark research on virtual water, water footprint assessment and accounting provide new ways to understand, communicate, and stimulate action for water security. Allan's breakthrough was to highlight that societies can meet their needs for food security even in constrained hydrological settings by importing produce and "embedded water" from elsewhere. A sophisticated and standardised set of approaches and data sets now exist which allow us to quantify and trace the water footprint of countries, companies, cities, commodities, products, and citizens, to basins of production.

The FWF Declaration commits its signatories to transformative action to ensure: zero pollution; equitable and sustainable water withdrawal and use; universal access to safe WASH; protection and promotion of nature; and resilience to climate change in their supply chains by 2030.

A water footprint indicates the total volume of freshwater used to produce goods and services, and includes volumes consumed as blue (withdrawn from lakes, rivers, and aquifers), green (rainfall), and grey (polluted) water.

> 1,700 litres of water are needed to produce a bar of chocolate; 8,000 litres of water are used to make a pair of jeans; and 12,000 litres of water are used in the production of a mobile phone. The average UK household uses 11,148 litres – the volume of 74 bathtubs – of embedded water every day; and **64% of this embedded water is from outside the UK.**

Fair water footprints

Fair water footprints are characterised by water use that causes zero pollution; uses water within sustainable limits; respects and promotes the human right to water and sanitation; protects and promotes nature; and builds resilience to climate shocks and conflict.

Unlike carbon, the optimal response is not necessarily to seek a reduced water footprint. Whilst the volume of water used and water efficiency are important, they are not the most important measures, and reduction in use is not always the most appropriate response. The natural replenishment of water within the hydrological cycle, and water storage, means that in most locations there exists a level of use which is sustainable without imposing negative impacts on other water users, communities, or nature.

The most important question is: Are our water footprints sustainable, equitable, and "fair"?

> **Fair water footprints** can ensure that globalised supply chains support, rather than undermine, shared water security, thereby accelerating progress on development, water supply, and climate adaptation. Listen to **citizen voices for fair water footprints**.

The global production and consumption of food, clothes, and goods such as mobile phones, computers, and cars have a major influence on society's climate and water challenges, and their solutions. Our water footprints shape water and climate security for millions of people.

> As the climate emergency escalates, we have a once-in-a-generation opportunity to change the way we interact with water and to harness the power of our water footprints – as individuals, companies, and countries – to ensure that they drive fair, sustainable, and resilient water use by 2030.

Water stewardship

Action for fair water footprints can trigger a wide range of contextually appropriate responses, including NbS to tackle shared water management challenges.

Key messages from the Glasgow Declaration for Fair Water Footprints for Climate-Resilient, Inclusive, and Sustainable Development (FWF Declaration)

> Our water footprints – the water used to produce the food, clothes, and goods we consume – shape water and climate security for millions of people across the globe.

> We all have an obligation and opportunity to harness our water footprints so that they "do no harm", and "do good" for people, ecosystems, and climate resilience.

> The FWF Declaration is a ground-breaking, urgent, and a vitally important milestone which can transform how water is used in our global economy for good.

> FWF Declaration signatories are accountable for decisive and specific action to improve water management and to secure a fair water footprint by 2030.

> Transformative action is underway: many of the tools, systems, and best practice needed to deliver a fair water footprint are already in place.

> All interested parties are invited to join this COP26 initiative and to mobilise the leadership and partnership needed to shape a more resilient, just, and water-secure world.

> A Programme Management Unit led by Chatham House has been established to support existing and new signatories, and financing to support delivery will become available in 2023.

> New signatories are invited to join this leadership effort. The support and learning mechanisms being established will assist all stakeholders and governments to de-risk their activities and economies against climate and water-related hazards.

The ideal response from businesses and other water users is water stewardship, i.e. multi-stakeholder engagement to understand and address water-related challenges at site, city, and catchment scale.

A global water stewardship standard has been developed by the **Alliance for Water Stewardship** to recognise, guide, and benchmark best practice. Multiple examples exist around the world of how improved water stewardship can de-risk business operations and investment, drive operational efficiency, embed resilience in supply chains and create new opportunities to solve long-standing water problems.

Water Witness and CDP, together with partners from the UK, Finnish, Malagasy, Malawi and Peruvian governments, together with a wide range of businesses and civil society organisations, are collaborating to scale up good water stewardship so that it becomes the global business norm. They aim to transform how the global economy interacts with the water environment and increase the resilience of local communities.

For more on good water governance, **listen to Dr Nick Hepworth**.

For more information, visit this **webpage on fair water footprints**, read K4D's ***Tackling the global water crisis: The role of water footprints and water stewardship***; see the Glasgow Declaration for Fair Water Footprints and FAQs and this video short.

As part of its commitment to Fair Water Footprints, the UK Government is also supporting a number of domestic and global water stewardship initiatives designed to build the resilience of communities and businesses in a changing climate. For example:

- In an important step towards ensuring greater accountability in the corporate sector, by 2025 it will be compulsory for UK companies and investors to disclose their financial exposure to climate risks, including those associated with water – in line with **recommendations from the Task Force on Climate-related Financial Disclosures** (TCFD).
- The **Roadmap towards Water Security for Food and Drink Supply**, launched by WRAP in November 2021, sets out a vision and key pathways to deliver the **Courtauld Commitment 2030** water target, i.e. that 50% of the UK's fresh food is sourced from areas with sustainable water management.
- To support this, the UK's **Joint Nature Conservancy Council's trade-weighted water footprint calculator** was launched in October 2021 as part of a programme to track the environmental impacts embedded in commodity consumption.

FCDO is also supporting the development of the **AGWA Water Tracker** to help turn climate commitments into effective and bankable programmes of work, meaning that climate risk has been properly taken into account in national plans. This in turn will encourage more climate-resilient water investment to developing countries through, for example, the **Resilient Water Accelerator** being co-developed with a consortium of partners, including WaterAid.

Water footprint metrics are based on annualised Water Footprint Network data, with a water scarcity metric combining these data with **AWARE** factors.

7 Water finance

Kathleen Dominique, OECD Environment Directorate

The importance of water security to peace and broader economic development and resilience is increasingly recognised at the international level, as reflected by the SDGs, deployment of **water diplomacy**, the annual G20 Dialogue on Water, as well as the United Nations 2023 Conference on Water.

Investments that contribute to water security span a range of essential infrastructure to deliver clean drinking water, reliable sanitation, and resilient management of water risks (floods, droughts, pollution, etc.). They deliver substantial benefits in terms of food and energy security, resilient urban development, biodiversity and nature, public health, and education.

Investments in water security can have a strong international dimension. This is typical when dams upstream of a border or untreated wastewater affect water availability and livelihoods of communities in riparian countries downstream. This is also the case when water risks contribute to migration.

- The economic case for investments in water security is robust. Economic losses related to water insecurity are estimated to include US$260bn per year from inadequate water supply and sanitation, US$120bn per year from urban property flood damage, and US$94bn per year of water insecurity to existing irrigators (**Sadoff et al., 2015**).
- At the same time, the global costs of achieving SDG 6 on water and sanitation exceed US$1tn per year, or 1.21% of global gross product (**Strong et al., 2020**) . Yet, financing flows have long remained well below levels commensurate with the need. The world is not on track to meet SDG 6 and lack of financing is well recognised as a major impediment.

Investments in water security are an essential enabler for COP26 goals

Investments in water security are an essential enabler for climate action. Many of the effects of climate change manifest through the water cycle, such as changing precipitation patterns and increased intensity and frequency of floods and droughts.

- Water-related investments can make considerable contributions to mitigation and adaptation efforts, thereby helping to accelerate the transition to net-zero emissions and strengthening climate resilience.

Examples include:

- For adaptation and resilience:
  - Investments in sustainable irrigation and water resource management play a pivotal role for adaptation strategies in the agricultural sector, and can increase climate resilience of rural communities. Expanding small-scale irrigation, for example, can benefit between 113 and 369 million rural people (**Xie et al., 2014**).
  - Flood protection that factors in climate-induced increasing intensity of floods over the next decades can strengthen adaptation and resilience to future risks. NbS for flood protection and water security are particularly apt to enhance resilience thanks to their flexible and adaptive nature.
- The mitigation and net-zero strategies:
  - Water-related activities account for 10% of global greenhouse gas emissions. In particular, water and wastewater utilities contribute to 30–40% of a municipality's energy use (**WaCCliM, 2020**). Investments in water efficiency improvement of water supply and sanitation services, for example, can reduce the sector's energy use and thus limit carbon emissions.
  - Wetlands and peatlands can store twice as much carbon as the planet's forests (**UNEP, 2019**). Investing in wetland conservation or restoration contributes to natural carbon capturing.

> ***Investments in water security are an essential enabler for climate action***

Strategically linking water-related investments with climate action can help achieve both climate goals and water security, and unlock financing flows; for example by:

- Attracting additional financing and funding for resilient water security arising from the increasing strategic focus on climate action by governments and development banks, such as funding to support National Adaptation Plans or from dedicated climate funds;
- Enabling new revenue streams, for example through carbon credit markets; or
- Creating opportunities to attract new types of financiers and investors, such as finance from climate-conscious commercial investors.

Current debates and innovations around water and finance

Expanding the range of potential sources of funding and financing for water security

Scaling up financing for water security will require more than calls for additional funding for the sector. It requires strengthening the enabling environment for investment and the risk–return profile of projects through more robust cost recovery and risk mitigation. This includes exploring blended finance (the strategic use of development finance to crowd in additional finance) where appropriate.

The need to better understand how water risks may generate material financial risks for the financial sector

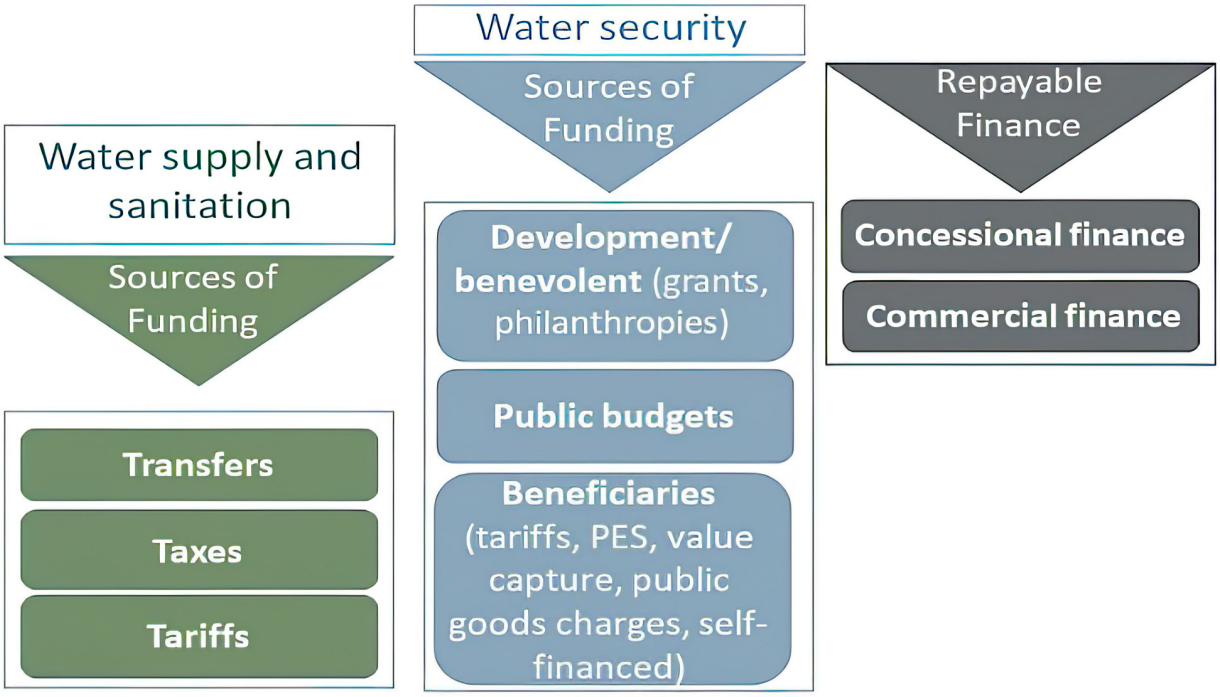
Financial materiality is a key driver of financial decision-making. When risks, such as water-related risks, are considered financially material, action to mitigate their financial impact may be more likely to follow.

While water insecurity already generates significant economic and social impacts, the translation of such water-related risks into financially material risks for the financial sector appears modest to date. Several factors may explain this. For example, current approaches to risk assessment do not fully capture all types of risks (including water-related risks) and when they are included, they are not fully priced. Current prudential regulations for the financial sector do not explicitly refer to environmental risks.

As a result, there could be a "materiality gap" between the substantial economic impact of water-related risks (which are well documented and rising) and their financial materiality in the global financial system.

These issues are topical for policymakers and financial institutions. If risks are not properly assessed and disclosed, and yet are financially material, the judgement of investors on the level of risk-taking when investing in a company (but also a financial institution, or a sovereign or sub-sovereign borrower) could be impaired. See **Watered down? Investigating the financial materiality of water-related risks in the financial system by OECD**.

Figure 6. Potential sources of funding and financing for water security.



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A need to facilitate dialogue between the water community and the finance community

Though the lack of financing for water security has been a persistent issue, there has also been a disconnect between the water community and the finance community. There has been a pressing need for practical and action-oriented dialogue among these two communities. The **Roundtable on Financing Water** – the only dedicated forum on water financing at the international level – was established in 2017 to address this need. The Roundtable is a joint initiative of the OECD, the Netherlands, the World Water Council, and the World Bank.

Since 2017, Roundtable meetings have engaged several hundred participants representing governments and regulators in developed, emerging, and developing economies, as well as private financiers, development financing institutions, and experts. The Roundtable has contributed to a better understanding of the distinctive bottlenecks that hinder the mobilisation of the full range of sources of finance to contribute to a water-secure future – and a diverse range of good practices have been shared.

Building on this wealth of information and examples, the OECD is launching the **Global Observatory on Financing Water Supply, Sanitation and Water Security.** This work will provide a unique repository to:

- Document and share good practice on financing water-related investments;
- Encourage peer-to-peer learning about the policies, institutional arrangements, and financing approaches required to scale up investment; and
- Enhance thought leadership and horizon scanning for new developments.

Further information on water and finance

- **The Roundtable on Financing Water**: Key messages, background papers, and presentations from the series of meetings at global and regional levels (the Americas, Asia, and Europe) as well as thematic meetings (on agricultural water and on climate action).
- ***Financing a water secure future*** and other **OECD publications on financing for water security**.

Key messages about water and finance

Addressing the financing challenge requires more than calls for increased funding. It needs accelerated and concerted action on multiple fronts to:

1. Make the best use of existing assets and finance and ensure investments benefit those most in need.
2. Strengthen the enabling environment for investment, including the policies, regulations, and institutional arrangements that create conducive conditions for financing to flow. This includes both water-specific policies and policies related to the financial sector and capital markets.
3. Pursue strategic investment planning in sectors that affect – or would benefit from – water security (most prominently urban development, agriculture, energy, environment) to ensure resilient investments over time in the context of uncertain future climatic conditions and demographic, urbanisation, and economic shifts.
4. Mobilise additional sources of finance from a range of public and private sources. Policymakers and financiers can seize new opportunities that arise from growing interest in sustainable finance, such as the development of taxonomies for sustainable activities, and green and blue bonds. Increased policy impetus and investor appetite to align finance with environmental ambitions is an opportunity to mobilise additional finance for water security and to discourage investments that undermine it.

8 Water finance and Water Risk Filter

Chiara Trabacchi, Chris Chijiutomi and Zinhle Tshabalala, British International Investment (BII)

Enhancing companies and investors' ability to assess and adapt to water-related risks under various climate change scenarios

Climate change is a key driver of water-related risks, which can have significant negative socioeconomic and financial impacts. Managing water-related risks and investing in water security is a priority condition for sustainable, climate-resilient growth and development. This is particularly relevant and urgent for the countries served by British International Investment (BII) (formerly CDC Group) which are among the world's most vulnerable to climate change.

To increase the ability of investors' and companies' to adapt and become resilience to climate change shocks and stresses, **British International Investment (BII)** partnered with WWF in 2021 to enhance the Water Risk Filter Tool. This is a leading online tool for assessing and responding to water-related risk across companies' operations and supply chain, or investors' portfolios.

The partnership between British International Investment and WWF helped enhance the tool's functionalities such that to enable companies and investors to assess water-related financial risks under various climate change scenarios and temperature pathways. Climate-related scenario analysis is a key recommendation of the Task Force on Climate-related Financial Disclosure (TCFD).

Launched on 24 November 2021, the upgraded **WWF Water Risk Filter version 6.0** enables investors and companies using it to perform scenario analysis of water-related risks to inform long-term business strategies and investment decisions for building climate resilience. Incorporating forward-looking water risk considerations into business strategies and investment decisions is critical to understand the "why and how" to invest in building climate resilience.

Along with the website's new look, the most important upgrades include:

- Unique climate and socioeconomic-based scenarios to assess future water risks using scenario analysis as recommended by the TCFD
- New higher-resolution data set for Europe along with best available global data sets; and
- Improved interface to manage user data and visualise risk assessment results.

Furthermore, WWF is also planning to integrate another feature to the tool, the Water And ValuE (WAVE) assessment functionality to enable users to explore how water-related risk may potentially affect financial value.

WWF is also planning integration of the Water And ValuE (WAVE) tool to enable users to explore how water-related risk may potentially affect financial value.

As part of this partnership, the enhanced WWF Water Risk Filter will be applied to a sub-set of British International Investment's portfolio to assess climate-water risks and identify opportunities for fostering investments in climate adaptation and resilience measures.

The WWF Water Risk Filter helps reach COP26 goals by:

- Increasing awareness and knowledge about climate-related water risks and capabilities to manage them

> ***Managing water-related risks and investing in water security is a priority condition for sustainable, climate-resilient growth and development.***

through investments in climate adaptation and resilience-building measures.

- Increasing the accessibility of the tool to support the incorporation of climate-related water risks and opportunities into business strategy and investment decision-making processes with foresight.
- Mobilising the private sector to share experiences and lessons, and to collaborate to scale investments for solutions towards a water-secure and climate-resilient future.

British International Investment and WWF speaking events and communication materials related to the WWF Water Risk Filter

- May 2021 – **Joint announcement on the partnership**
- August 2021 – **World Water Week presentation**
- November 2021 – **Blog post on helping businesses build climate resilience with the filter**
- November 2021 – **WWF's launch announcement**
- December 2021 – **Joint presentation on key enhancements**
- February 2022 – **Joint podcast on managing water risks**

Key messages about the WWF Water Risk Filter tool

As climate and water risk are closely interlinked, British International Investment acted as a lead partner for enhancing the WWF's Water Risk Filter tool. The enhanced version of the tool enables companies and investors to assess water-related risks under different climate change scenarios and time frames.

Through this project, the British International Investment and WWF partnership aimed to:

1 Mobilise greater awareness, and prompt action amongst financial institutions and companies about climate water risks in under various scenarios and timeframes

2 Provide investors and businesses in developing and emerging markets with a publicly available tool that can help them better understand climate-related water risks and the opportunities and benefits that can arise from early investments in climate adaptation and resilience-building actions.

3 Strengthen engagement with investees on water-related risks for climate change resilience.

9 Gender and water

Deepa Joshi, Upandha Udalagama and Alan Nicol, International Water Management Institute (IWMI)

The international community is moving slowly towards the SDG 6 targets on water and sanitation, but current progress is insufficient to achieve them. In 2020, just over **a quarter of the world's population still lacked access to safely managed drinking water services** (SDG indicator 6.1.1); and 46% lacked safely managed sanitation services (SDG indicator 6.2.1a) (UN-Water). And where households face water shortages, in **four fifths it is women and girl children who are responsible for water collection**. The current SDG 6 challenges are therefore deeply embedded in structural gender inequalities – and vulnerabilities.

> **"Women are disproportionately affected by climate change impacts such as droughts, floods and other extreme weather events. They also have a critical role in combatting climate change but need to be better represented at all levels in the decision-making. Empowering women will be a significant factor in meeting the climate challenge."**
>
> – UNFCCC Executive Secretary, Christiana Figueres, 2014 (**Aguilar et al., 2015**)

In key parts of the world – including sub-Saharan Africa and the Asia-Pacific region – progress is particularly slow, especially on sanitation. In **sub-Saharan Africa, 70% of the population did not use safely managed drinking water services under SDG indicator 6.1.1 in 2020**, and nearly 80% of the population did not use a safely managed sanitation service. In the Asia-Pacific region, UNESCAP reported in 2021 that **the region was not on track to achieve any of the targets for clean water and sanitation**, citing water stress as the major reason why the situation had significantly worsened since 2000.

The challenges are multifaceted. UN Women reports that malnutrition and irregular access to water and nutrition impacted 2.37 billion people in 2020, **with women in over two thirds of nations being at greater risk of food and water insecurity than men** (**UN Women, 2018**). Where water scarcity is increasing, this means poorer women will have to travel even further to gain access to household supplies, increasing their workloads and time demands, as well as exposing many to potential sexual and gender-based violence.

The water crisis is therefore a gender crisis that has major implications across a range of other SDGs. The time-related costs alone of women's work collecting water can have huge productive and reproductive **opportunity costs**. In East Africa, women regularly trek over 10km a day to collect water, the impact of which includes huge lost calorific value. Knock-on effects can be intergenerational as reduced calorific values can impede foetal development in pregnant women.

> **With women forced to spend time near water sources, some of which are contaminated, their risk of being infected with waterborne diseases increases. Household water insecurity can exacerbate water-washed diseases when hygiene habits are neglected to conserve water for drinking and cooking.**
>
> (WHO, 2014) (**Aguilar et al., 2015**)

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Two major disruptions are now adding additional stresses – one longer term and one more immediate. How these are tackled will determine to a great extent future SDG 6 progress. **COVID-19 has disrupted social and economic systems in all regions** since 2020, including increasing inequalities and disrupting mobility and informal employment, which is often at the heart of women's livelihoods in sub-Saharan Africa. On top of this, **climate change is driving faster-than-anticipated shifts in weather systems**, including major shifts in the hydrological cycle with a tendency towards seasonal disruptions and weather extremes in many regions. This has a disproportionate impact on women.

The water crisis *as household water insecurity* is nested within the broader climate crisis, both of which are central to global gender inequalities. Effectively tackling disruption to the hydrological cycle under global warming will play a key role in addressing gender inequalities, but only if we build on past experience.

Scale and depth of the water and gender crisis

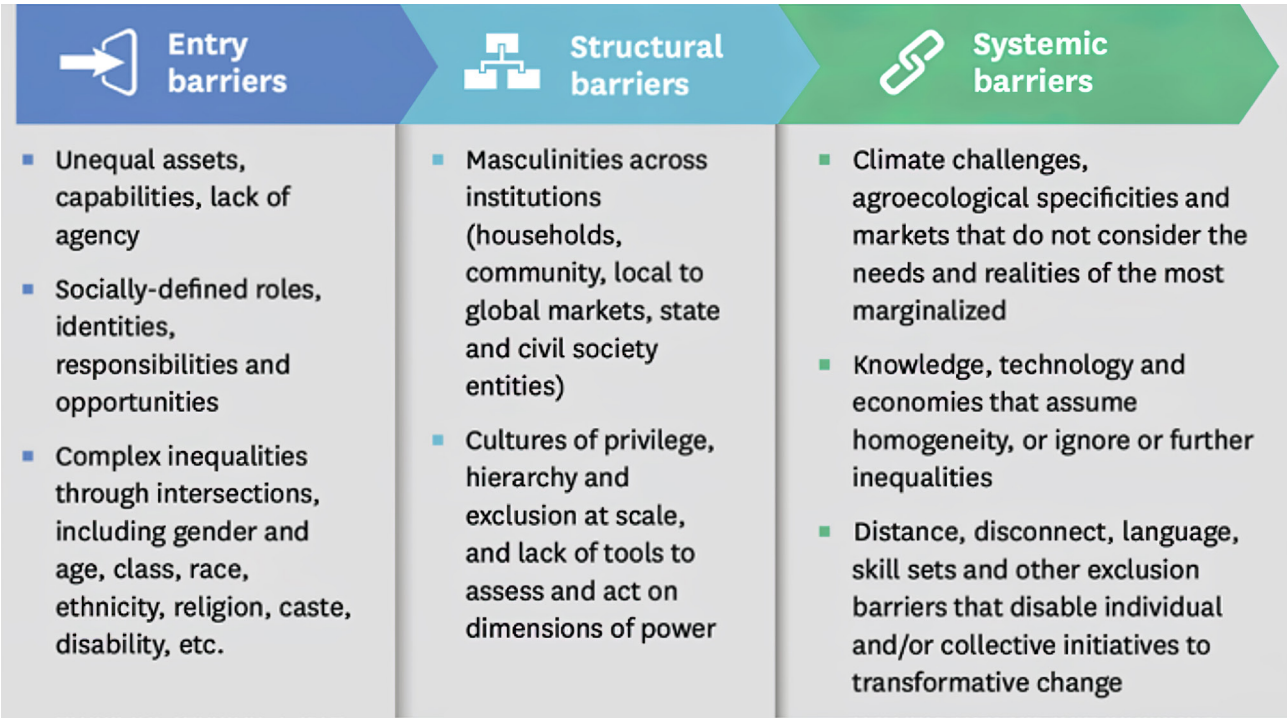
Having sought to achieve greater equality in women's access to water and sanitation, as well as stronger engagement in water management, governments and agencies now face a new reality. Women "in development" – with an emphasis on participation – has been central to past efforts. **At the same time as participation increased, however, arguably structures of power in which gender inequalities are embedded remained relatively unchanged.**

While a central tenet of the "Water Decade" of the 1980s, and a large feature of the Dublin principles and outcome of the 1992 Earth Summit in Rio, was to increase participation in water management by women (somehow "naturalised" into this role), the results were not that successful. During the 1990s and 2000s, efforts focused on new mechanisms to help speed up delivery of WASH services (e.g. public–private partnerships and community-led service delivery), but still structural inequalities persisted. The COVID-19 pandemic has added further disruption and set back progress in tackling structural gender inequalities. Indeed, on recent trajectories, it was estimated that worldwide it would **"take 135.6 years to close the gender gap…. Gender-sensitive recovery strategies will be critical in making up ground lost during 2020".**

We need to tackle the risks – and rethink structures that generate gender inequality in water

The focus in the water community addressing the combined water, gender, and climate crisis has therefore moved to tackling structural impediments to equality. **This has been termed adopting "gender-transformative approaches" in which efforts focus on tackling institutions and structures of power, including those that construct patriarchies and enable the persistence of gender inequalities often**

Figure 7. Barriers to gender equality and inclusion



Source: IWMI (2020, p.5). Used with permission.

in spite of greater women's participation. Part of this shift in paradigm has been driven by global movements such as #metoo and other movements.

A strong emphasis of the **Water Pavilion** during COP26 in 2021 was in rethinking structures and considering the "water crisis" as a core element in the "climate crisis".

That **women and children are 14 times more likely than men to die during a climate and water disaster** underscores in stark terms the interlinks between these crises, suggesting that there is indeed a "complex development crisis" emerging.

In 141 countries from 1981–2002, on average, both geophysical and climate-related risks, and subsequent repercussions, resulted in a higher death rate for women than men (**Neumayer and Plümper, 2007**). And this was not just a result of physical challenges, but also the way "socio-cultural attitudes towards gender differences, not biological ones, create increased risks and vulnerabilities during situations of too much or too little water" (ibid.). Rethinking formal and informal power structures is therefore central to addressing this complex situation.

Put simply, in some contexts, women are denied the right to leave their homes without the permission of men in their families or communities (**Nellemann et al., 2011**) and this can hinder access to disaster-related information, with serious consequences. **During the 2009 floods in Gujarat, India, for instance, disaster warnings were commonly sent via television, radio, and mobile phones; however, these devices are more utilised by men than women** (**Ahmed and Fajber, 2009**). Yet in tackling these complexities **simply targeting women is not enough**. **Helping to build resilience to risk in relation to water in a climate crisis requires that marginalised women "adapt to diverse climate challenges"** requiring "fixing systemic and structural inequalities", and not just promoting participation. Figure 7 illustrates the range of barriers women can face.

Gender in agriculture, water, and the environment

Tackling structural gender inequalities is also a priority in agricultural water use. One way forward is to enhance collective action approaches. Action research in climate and poverty hot spot regions of Bangladesh, India, and Nepal, for instance, shows that **resource-poor women can improve livelihoods and food security and navigate feudal patriarchies by organising as collectives**. In Bihar, agrarian stress combined with limited off-farm labour opportunities that result in male out-migration, have driven **processes of feminisation of agriculture**. Here, marginalised and tenant farmers, particularly women, have reported increasing workloads

Female farmers, on average, represent about 43% of the labour force in developing countries and up to 60% in Africa and South Asia (FAO, 2017; White et al., 2021). Yet, even with the bestowed responsibility for food production, women are unable to acquire sufficient water for crop cultivation, drastically restricting food security and income generation for their entire community (Anderson et al., 2015). Where climate change negatively impacts water for crop and livestock production, the future burden will fall disproportionately on rural women.

but high food insecurity aggravated by **constrained access to land, water, credit, and other resources**. With the support of a consortium of government, research, and NGO partners, IWMI facilitated landless and marginal female and male farmers to **self-organise into 16 (now 20) farmer collectives in six villages**. Independent analyses of this collective farming experience in Nepal and in India shows that years after production began, this approach was particularly successful in **shifting entrenched power relations in water and land management to the benefit of marginal farmers, particularly poor, landless women**. This is one small example of ways to tackle structural inequalities in deeply patriarchal contexts.

Urban contexts, gender, and WASH insecurity

At a global systems level, **COVID-19 has highlighted WASH–gender inequalities** and challenges in urban areas. In many cities, WASH services are systematically failing to meet specific needs and interests of girls, women, as well as people with disabilities. In particular, **COVID-19 provided a reminder** that resilience to crises among the most marginalised is fragile, both in rural and urban contexts. In **Nepal**, recent work has demonstrated **how poor access to water creates additional stress for women**, especially those responsible for domestic care work. This leads to physical and emotional stress, including shame, anxiety, worry, and lack of sleep.

Water insecurity – and the complex of crises illustrated above – is not just about more measurable and quantifiable challenges, but also about socio-psychological impacts and societal changes. A new framework to analyse **Water Insecurity Experiences (WISE)** helps demonstrate the complex and interrelated group of problems at scale across a range of countries and regions, including perceptions of water insecurity.

Key reading

- **Roots for the Future: The Landscape and Way Forward on Gender and Climate Change**, Aguilar, L., Granat, M., & Owren, C
- **Engendering adaptation to climate variability in Gujarat, India**, Ahmed, S., and E. Fajber
- **Promoting Resilience, Rights, and Resources: Gender-Responsive Adaptation Across Sectors**, Anderson, C., Aguilar, L. and Gilligan, M
- **Tackling Climate Change Through the Empowerment of Rural Women**, FAO
- **Women at the frontline of climate change: Gender risks and hopes. A Rapid response assessment**, Nellemann, C. Verma, R. and Hislop, L
- **The Gendered Nature of Natural Disasters: The Impact of Catastrophic Events on the Gender Gap in Life Expectancy, 1981–2002**, Neumayer, E., Plümper, T
- **Turning promises into action: Gender equality in the 2030 Agenda for Sustainable Development**, UN Women
- **Gender, Climate Change and Health**, WHO

10 GCRF Water Security and Sustainable Development Hub – case studies

GCRF Water Security and Sustainable Development Hub

The GCRF Water Security and Sustainable Development Hub's research programme is building understanding across water security systems. Its transdisciplinary approach is breaking down traditional siloed ways of thinking to address five systemic barriers to water security: (i) insufficient data; (ii) unfit service delivery models; (iii) fragmented governance; (iv) unsuitable solutions to localised problems; and (v) limited community involvement.

They are tackling these barriers through six work streams – Collaboratories, Tools, Risks and Data, Values, Governance, and MEL – which bring together international researchers and partners. The following case studies demonstrate some of the practical ways that water security is being addressed in different contexts.

Climate change risks to water security

Water security is the most sensitive risk to climate change. The Hub is developing new methods to analyse risks that support stakeholders – from communities to national government – to better manage climate change.

Capacity building for resilience: Vulnerability, water security, and social inequity in Colombia

In Colombia, water and food security are crucial for socioeconomic development, cultural preservation, climate change resilience, and political stability. COVID-19 spurred the Hub to develop socio-technical innovations to urgently address these issues during the pandemic.

- **Water security in rural communities.** The sixth IPCC report (to which Hub researchers co-authored) highlighted the need to integrate diverse forms of knowledge, including indigenous and local knowledge, in addressing climate change. This video highlights research with local communities in the Upper Cauca River Basin in Colombia, an area experiencing socio-ecological difficulties, to strengthen water security and environmental sustainability.
- **"In the Andes of Colombia, communities sow water".** Indigenous peoples' lived experiences, knowledge, and traditional practices are crucial to enabling climate change adaptation for sustainable development. In the video ***Sowing of water***, women from the Andean indigenous reservation of Kisgó explain the process of sowing water for ecological conservation, community wellbeing, and cultural preservation.

Multi-sectoral capacity building for water security in Ethiopia

Water is an unstable and contested resource in Ethiopia, exacerbated by rapid industrialisation and urbanisation, and the prioritisation of economic growth over ecological health. The Hub is working with stakeholders to build capacity across sectors to realise a more integrated and holistic approach to managing water systems.

Climate resilience through water-sensitive planning and management in India

Delhi's water demand is ever increasing but the absence of integrated urban water management, as well as inter-state tensions, means disputes over water resources are common. The Hub is working across government scales and stakeholder groups to embed water management into urban planning in order to realise Prime Minister Modi's commitment to universal and equitable water security.

Building capacity to enable coherent water governance in Malaysia

Water plays a vital role in Malaysia's economic development but there are tensions between economic growth and environmental sustainability. Through collaborations with policymakers and agencies, the Hub is assisting the government in shaping sustainable practices and policies to ensure a water secure future.

In the Malaysia water security field video, Hub researchers explain how their work will contribute towards the better management of the Johor River Basin by addressing water pollution and climate change impacts.

Upcoming events and networks

- Global Water Summit **16–18 May 2022 in Madrid on the theme of "Water-Positive, Zero Carbon"**. The Summit is a high-level knowledge-sharing platform that gives access to expert contributions, ideas, and intelligence from the speakers that represent the most significant opportunities in the global water sector. The agenda gathers leaders representing utilities, industry, finance and investment, and key water market players.
- World Water Week **23 August–1 September 2022** will take place online and in Stockholm under the theme "Seeing the Unseen: The Value of Water". The world's most pressing challenges will be addressed, and session proposals can be submitted now.
- United Nations 2023 Water Conference **22–24 March in New York**. The Conference will be preceded by regional and global preparatory meetings and informed by existing water-related meetings at the regional and global level.
- Africa 2022 Water Storage and Hydropower Development for Africa 18–20 July 2022 in Uganda. Delegates from around the world will focus on the most relevant topics facing Africa today.
- COP27 **7–18 November 2022 in Egypt**. The 27th session of the Conference of the Parties (COP 27) to the UNFCCC will take place in Sharm El-Sheikh, Egypt. To receive updates from the SDG Knowledge Hub, subscribe to the **SDG Update newsletter**. To explore more climate change reporting, read the full **Earth Negotiations Bulletin summary and analysis of the Glasgow Climate Change Conference COP26** or view all **UNFCCC negotiation coverage**.
- Second International High-Level Conference on the International Decade for Action **"Water for Sustainable Development", 2018–2028 6–9 June 2022**. The Conference will include 12 thematic and interactive panels focused on SDG 6, other water-related goals, the goals of the Water Action Decade, and the areas on means of implementation.

Key reading

- **Stockholm International Water Institute (SIWI)'s library** of a wide range of knowledge products about water-related issues. Browse latest publications or filter by topic to find resources on the area of interest.
- **Water Witness: Driving water stewardship**. Great examples of water stewardship from around the globe.
- ***Water finance and nature-based solutions*** synthesises evidence on the innovations for water finance that could be applied to mainstream NbS and expanded in developing countries. This review also highlights some obstacles, opportunities, and potential synergies pertaining to water finance and NbS.
- ***Nature-based solutions and water security*** highlights some of the best practice examples of NbS for water security and examines the implementation challenges and lessons learned.
- ***Water security beyond COVID-19*** synthesises evidence about what developing countries can do over the next five years to improve water security in preparation for a potential increase in disease outbreaks and pandemics such as COVID-19. Interventions to strengthen water security focus on four key areas: (i) adequate water availability; (ii) acceptable water quality; (iii) water resources management; and (v) affordable access to WASH.
- ***Water for the urban poor and COVID-19*** examines the provision of water for the urban poor in the light of COVID-19 and proposes practical measures that can be taken to improve the availability of water.

Key videos

Henk Ovink – Water solutions for climate change. Henk Ovink, Special Envoy for International Water Affairs for the Kingdom of the Netherlands, discusses the need for a more holistic, circular approach to water and climate change, including the adoption of NbS for climate adaptation and resilience. Speaking on water in relation to COVID-19, Henk added: "Water, sanitation and hygiene (WASH) are not only the first line of defence, they are also the best step for sustainable recovery. Water scarcity is a global problem that needs collective action. Now is the time!" Filmed on 11 March 2020.

Henk Ovink – Water: Connecting the SDGs. Water is a connecting issue that cuts across the whole 2030 Agenda and is fundamental to achieving the SDGs. Henk Ovink explains how through a deeper understanding of the inter-dependencies and complexities of these intersections, we can leverage water for real sustainable development. Filmed on 11 March 2021.

John Matthews – Water and climate change: An opportunity. John Matthews, Executive Director and co-founder of AGWA, discusses how we can redefine climate change issues as opportunities to bring people together and create more productive and positive solutions.

Rachael McDonnell – Practical tools for water security. Rachael McDonnell, Strategic Program Director for Water, Climate Change and Resilience at the International Water Management Institute (IWMI), discusses how IWMI is using practical tools such as water accounting computer-based modelling to predict future water conditions, and drought and flood planning to help those who are most vulnerable adjust to the impacts of climate change. Filmed March 2020.

World Water Day 2022

In preparation for World Water Day 2022, we spoke some subject matter experts about this year's theme of groundwater, as well as the overall importance of water security and fair water footprints.

Callist Tindimugaya: Groundwater is a key resource in Africa

Alan MacDonald: A tale of two groundwaters

Natalia Duque: Alternatives to wastewater treatment in Colombia

Kathleen Dominique: Why finance matters for water

John Matthews: Water as a climate solution

Sareen Malik: Fair Water Footprints

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