NOVEMBER 2020

POLLINATION

UNIFYING AROUND A COMMON GOAL

AGREEING THE SCIENCE

UNDERSTANDING AND MANAGING WATER RISK

ATTRACTING FINANCE AND INVESTMENT

IMPROVING GOVERNANCE THROUGH A BASIN-BASED APPROACH

BUILDING SYSTEM-WIDE RESILIENCE

SOLVING THE WATER CRISIS: LESSONS FROM CLIMATE CHANGE

Front cover image:

MACKENZIE RIVER, NORTHWEST TERRITORIES, CANADA

In far northern Canada, pulses of freshwater flow down rivers after inland ice and snow melts. These pulses, known as a freshet, carry huge amounts of sediment. The sediment seen in this image flowed into the Beaufort Sea from the Mackenzie River, the longest northward-flowing river in North America.

Source:
Photo by USGS on Unsplash

ACKNOWLEDGEMENTS

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This report is targeted to those who are working in the water space as well as investors and corporates who have a critical role to play in ensuring a secure water future.

We are grateful for the funding provided by the BHP Group to assist in conceiving and contributing to this report and in doing so to encourage new thinking for global water stewardship.

BHP

POLLINATION

POLLINATION

“WATER IS LIFE.”

IT’S ONE OF THE MOST COMMONLY USED PHRASES IN THE WATER SECTOR, AND FOR THOSE WHO HAVE BEEN TO SOME OF THE MOST WATER-SCARCE PLACES ON THE PLANET, IT’S OBVIOUS.

Note from the authors

Aerial photographs of places like Egypt show a bright green band wending its way through the barren desert – the green banks of the Nile bright with life.

At the same time, and as the World Economic Forum is consistently acknowledging, water is in crisis. A significant decline in the available quality and quantity of freshwater, resulting in harmful effects on human health and/or economic activity. The sheer uncertainty around the future water availability is causing planning problems for cities, communities, businesses, farmers, and households. It relates to everything, and everyone, everywhere.

Water is an immense topic. From water access, water sanitation and hygiene to water scarcity. There is much to learn, to share and to understand, and even more to do if we are to protect and preserve our world's water supplies for the future. This report explores the lessons and learnings from climate change that we can extract and apply to water – as much what we should avoid, as what should apply.

In preparing this report we have had many discussions with people within the water and climate area to include their reflections on the strengths and pitfalls within the current approach to water and to identify where there are existing solutions that should be amplified. We recognise that this field contains a depth of expertise, insight and understanding. For this reason, this report does not intend to simply restate the current position on water.

Many of the solutions required to address the water crisis are already in operation in particular regions and through specific organisation platforms. What is required however, is rapid scaling of these existing solutions accelerated through collaboration. This report draws out some of the examples of the existing strengths within the water sector, and reflects on learnings we can take from the pitfalls within it. All of this is done within the context of the lessons we can take from within the climate space, which can be applied to accelerating action towards water's Sustainable Development Goal 6 (SDG6).

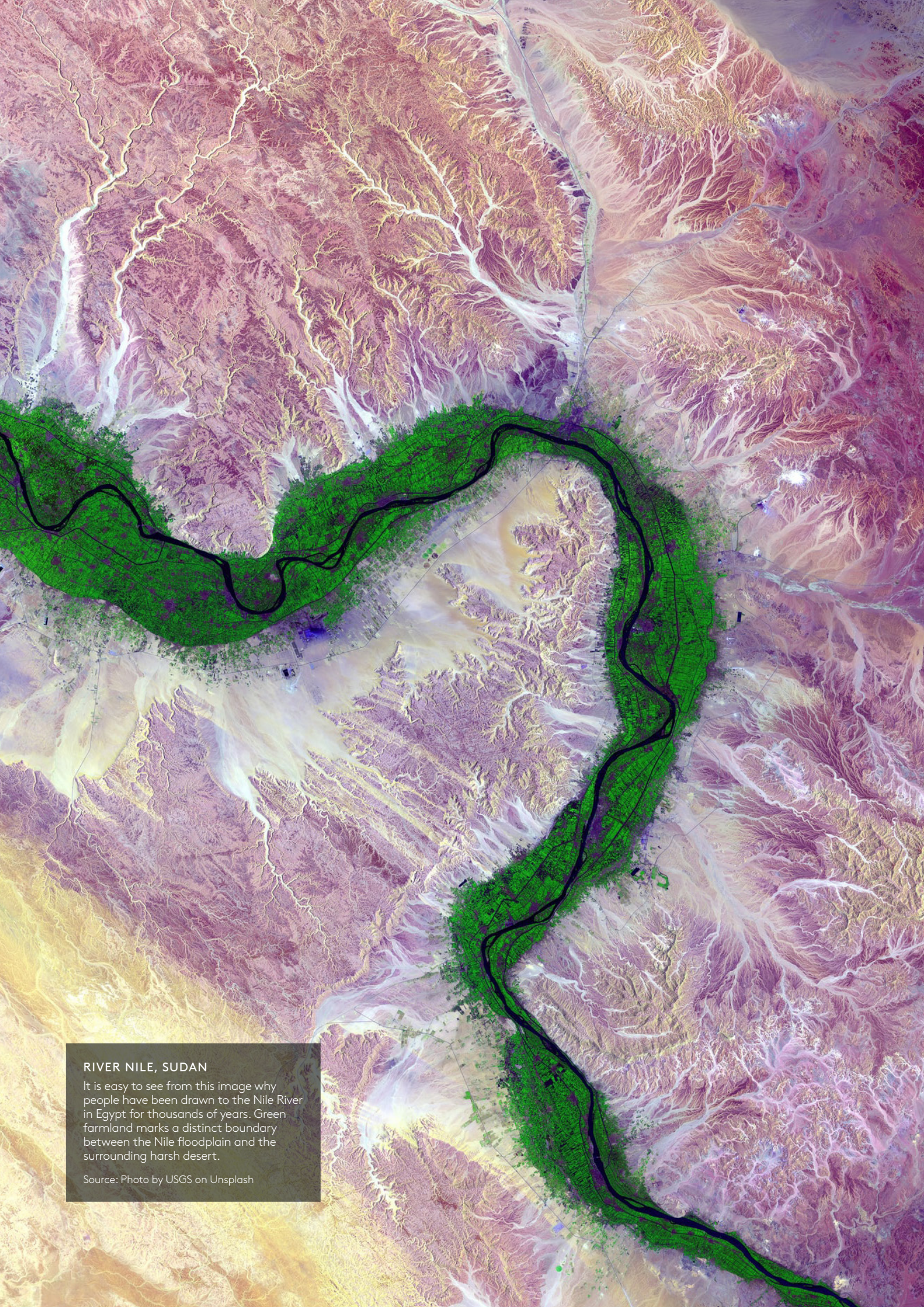
You will note that the recommendations in this report do not identify known actors within the water sphere who should progress these recommendations or lead them. This is a deliberate omission. Our call to action is for the water sector to now coalesce around these recommendations and come together to identify who is best to progress these recommendations, either led by individual organisations or through a coalition. This report is targeted to those who are working in the water space as well as investors and corporates who have a critical role to play in ensuring a secure water future.

We are grateful for the contributions and feedback on this report from the following individuals: Holly Buschman, Howard Bamsey, Dr Emma Carmody, Peter Gleick, Gemma James, Erika Korosi, Stuart Orr, Colin Strong and Jed Youngs. We are also grateful for the funding provided by the BHP Group to deliver this report and in doing so to encourage new thinking for global water stewardship.

I commend this report to you. May it spark thought, debate and, above all, a greater understanding of the challenges and opportunities we face as we address one of the greatest risks facing our generation.

Water.

Martijn Wilder AM.
Founding Partner, Pollination



RIVER NILE, SUDAN

It is easy to see from this image why people have been drawn to the Nile River in Egypt for thousands of years. Green farmland marks a distinct boundary between the Nile floodplain and the surrounding harsh desert.

Source: Photo by USGS on Unsplash

Insights and key recommendations

The Earth is facing a major water crisis. Freshwater ecosystems are dying, freshwater species populations are collapsing, and wetlands are disappearing faster than forests. While health messaging encourages good hand hygiene, billions of people lack access to adequate handwashing facilities. With an increasing demand for the planet's limited supplies of freshwater, material water shortages are visible around the world. Rivers no longer meet the ocean, lakes are drying up, towns report no access to drinking water and major cities are literally running dry. These are not just isolated incidents in far-flung places across the world, they're part of an increasing trend – the paring away of where we are now, from where we need to be: on water management, quality, access, availability, distribution and use. Without immediate action, that ever-widening gap (the "**Gap**") is expected to accelerate with massive repercussions on communities, economies, and ecosystems around the world.

This report explores the degree to which the history, context, and key elements of the approach to climate change can provide insights and lessons on dealing with, and managing, the global water crisis. Resolving a path forward to "Close the Gap" between the goals set out in **SDG6** and the current state of play will require an extremely rapid acceleration of action across all sectors, from consumers to policymakers, corporates and investors. Learning from the successes and failures of the climate community is a step on that path. Implementing those insights and lessons in a cohesive and strategic way across multiple geographies and a wider ranging group of stakeholders will require the water community to break down its traditional siloed approach and come together in a way it has never done before.

Insights

Over the last 30 years the international community has built a global international climate change law and policy governance regime, commencing with the 1992 United Nations Framework Convention on Climate Change (**UNFCCC**). This framework has been critical for bringing together and driving international effort on adopting commitments to address climate change and to set the ambitions to lower both annual carbon emissions, and consequently, total atmospheric concentrations of greenhouse gases. It has also supported significant engagement by non-governmental organisations and businesses driving measures that reduce greenhouse emissions and investing in activities that drive efforts to move the global economy to net zero emissions.

In the last few years, increasing pressure by investors, shareholders and financial regulators have accelerated action on climate change through driving a shift of capital and investment away from activities that contribute to climate change toward areas of the economy that will assist with decarbonisation, in particular new/renewable energy, transport and forestry.

Despite the increasing number of front page water-related disasters (floods, droughts, contamination), and being listed amongst the top global risks for multiple consecutive years, unlike climate change, water has failed to emerge on the international agenda as a core area of focus.

The recommendations that follow are drawn from an analysis of the successes and failures of climate change and lay out the lessons that can be applied from it to accelerate action on water. The recommendations in the body of this report are guided by several key insights:

SPEED IS KEY

The global water crisis is evolving extremely rapidly. There is insufficient time to replicate three decades of climate change negotiations and conventions and, therefore, any recommendations need to provide for a dramatic acceleration of progress.

Woman Farmer, Paddy Field, Nedumangad, India.

WATER IS ABOUT MORE THAN SUPPLY AND SCARCITY

Water extends far beyond issues of supply, scarcity, quality, sanitation, and management. Water underpins all ecosystems on the planet and holds enormous cultural and spiritual value for first nations communities. Water has the power to fundamentally change the lives of people around the world. Women and girls, rural farmers, fishermen, communities, economies – all rely on water for their existence. Water is not just about numbers, water is life.

GLOBAL VS BASIN

Whilst action on climate change centres around principles agreed at a global level, the nature of water and its catchments relies on a basin-level management approach, despite the complexities this may have with the redrawing of basin boundaries away from physical land-based constructs, like fence lines and in many cases national borders. This is both an opportunity (targeted goal setting, measurement and reporting) and a challenge (implying basin-related issues are purely local despite the global nature of supply chains which mean decisions on sourcing often occur at a distance from the location of the actual operations, and therefore water impact). Unlike climate change which has a single metric to denominate units of carbon (tCO2e), this global vs basin tension creates a challenge

for communication and universal understanding of water issues. Care should be taken in applying a purely basin approach as the major type of communication, and campaigns recommended will require a global approach in order to encompass global supply chains and other transboundary water challenges.

EXISTING VS NEW

Given the speed at which water risks are impacting our communities, supply chains and our economies, rather than recommend creating entirely new systems of governance mechanisms, where possible, effort should be taken to maximise, leverage and expand on what already exists.

NEXUS

Water is uniquely connected to climate, energy, food and the economy, and therefore decisions made related to water (and the other areas), cannot be made in isolation but must consider the full breadth of interconnectedness between these issues.

TECHNOLOGY TRANSFER AND CAPACITY BUILDING

Scaling and deploying water technology will be a key element to solving the water crisis. This will need to occur within and between national boundaries and appropriate incentives created to build a suitable ecosystem that accelerates its deployment.

QUALITY VS QUANTITY

Unlike greenhouse gases, water is considered a resource to protect and create more of – from support to technology, to pulling water from the atmosphere, to better approaches to storing water. Solutions should be considered that support a water management system that efficiently balances the need for quantity (e.g. for sanitation) and quality (e.g. for human consumption).

PRINCIPLES OF EQUITY

Water is not bound by national or sub-national boundaries, and its availability cannot always be bought. Between and within countries, managing competing needs in what are often politically fragile environments, requires the application of principles of fairness and equity that reach far beyond pure economic impact. These principles also prioritise the important environmental and cultural rights tied to water.

OUR CALL TO ACTION

One of the greatest lessons the water sector can learn from the successes and failures of the response to climate change, is that to take giant leaps of change, we need the siloed approach of the past to be replaced by a unified global course of action towards a single common goal. We have delayed long enough. The time to act as one is now.

Finally, as the international community continues to develop their commitments under the Paris Agreement, **the three barriers to delivering progress** on a scale meaningful to the global climate challenge also pose a risk to substantial action on water:

1.

A PERCEPTION THAT ACTION TODAY WILL MEAN ACCEPTING LOWER ECONOMIC GROWTH IN THE FUTURE

The prevailing view in resolving the climate change problem is that, despite the risks that are emerging, action is simply too expensive and uneconomic.

2.

A GAP IN DELIVERY OF FINANCE TO DEVELOPING NATIONS

Despite the current volume and forecast increase in emissions in developing countries, financing emissions reductions and adaptation activities in those nations has been vastly inadequate. Pledges made by developed countries pursuant to the concept of "common but differentiated responsibilities" saw a theoretical transfer of substantial amounts of capital to developing countries to help them meet their Paris ambitions, as well as to provide for funding adaptation to the changes in the climate regime which are now inevitable. None of these financial pledges have been met.

3.

A FAILURE TO IDENTIFY VALUE BEYOND TRADITIONAL FINANCIAL RETURNS

Financing adaptation measures and resilience in the climate sector, as well as the preservation of critically important global natural capital assets, (forests, watercourses, reef systems and biodiversity) whilst often providing sub par traditional financial returns, is critical to mitigating against the impact of climate change and delivering value to communities and ecosystems.

In the case of water it is critical that action to conserve water is seen as fundamental to protecting future economies and life itself; that developed countries help developing countries with water and climate finance given that they face the greatest challenge; and without conserving nature, forests and watersheds, the ability to deal with the water crisis will be impossible.

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Key themes

Whilst many will likely argue that progress towards achieving the climate goals has been slow, funding has been below both targeted and necessary numbers, and emissions are still increasing at an alarming rate, compared with progress on water, the results are aspirational. Climate is on the global agenda, investors are making declarations and divesting from fossil fuels, and there is widespread consumer recognition of the need to act.

For many in the water community, learning and understanding what lessons can be drawn from climate and applied to water is a key element in identifying a logical path forward. How has climate succeeded where water has failed? What needs to be done differently? What is it that water is missing that climate did right, or is doing that climate got wrong?

Climate and its community can teach us a number of lessons through its successes – and its failures. These can ultimately be boiled down into 6 key themes:

OUR SIX KEY THEMES

1. **Unifying** around a common goal
2. **Agreeing** the science
3. **Understanding and managing** water risk
4. **Attracting** finance and investment
5. **Improving governance** through a basin-based approach
6. **Building** system-wide **resilience**

These themes are explored further in this section. Importantly, they provide the insight for the detailed recommendations proposed, which will enable the key learnings and understanding drawn from the climate community to be applied to water.

1.

The need to unify & communicate around a common goal

Water has traditionally been a very siloed and often internally focused community. This has resulted in a diversification of priorities, competition for often limited resources and priorities, and even conflict between the different elements of SDG6. Competing for space on busy agendas in boardrooms and in the media has meant that water has failed to achieve the type of exposure it needs.

In comparison, climate change today is increasingly mainstream in the media. Influential finance and business leaders like Mark Carney and Larry Fink, talk openly about the risks of failing to act, and youth demonstrate on the streets in their thousands calling for action on climate change. Public, corporate and investor awareness of the need to act on climate is high. Action has unified around a 1.5 °C aspirational target, and various previously disparate actors have come together with the same message – we need to act now to meet our 1.5 °C target.

Water can benefit from a similar global objective or "North Star" designed to drive action to "Close the Gap" between the current state of play and the targets set out in SDG6. This will involve accelerating global and community action through working with key global non-profits, government stakeholders, thought and community leaders, and creating an independent third-party multi-stakeholder collaboration supported by a communications strategy. Importantly, this is critical to driving collaboration between the organisations and stakeholders working on water issues and overcoming siloing of approach.

OUR RECOMMENDATION

Adopt "Close the Gap" as a global goal for water

WATER'S "NORTH STAR": CLOSING THE GAP

Unify the water community around a single "North Star" for water to "Close the Gap" between the current status quo and the goals set out under SDG6. This "North Star" should be supported by a global communications campaign and leverage the power of storytelling to create both public awareness, and to drive corporate, investor and policy action in order to deliver on the goals set out in SDG6.

2.
The need to agree the science

Without an equivalent to the Intergovernmental Panel on Climate Change (IPCC), water is missing a comprehensive, agreed set of science and data that represents a collection and analysis of the state of water globally, and which makes recommendations for policymakers and conversations on the steps that need to be taken to address identified issues.

Setting up a full equivalent of the IPCC is neither realistic nor achievable in the timeframe or scale needed to meet the water challenge. Instead, a more rapid response is needed. This should include working with existing scientific organisations and bodies to develop and agree on a current scientific position on the status of freshwater, consider what type of policy recommendations and discussions should occur based on the science and data, and create a common uniformly recognised system for measurement and accounting. The latter has been particularly important for companies looking to report on their greenhouse gas exposure, and to organisations like CDP, WRI and CERES looking to assess their risk.

OUR RECOMMENDATION

Pursue a universally accepted approach to water data and science

ACHIEVE A UNIVERSAL SCIENTIFIC POSITION ON THE STATUS OF FRESHWATER

Convene a multi-sectoral, public-private working group to establish and publicly report on a universally shared scientific understanding on the status of freshwater around the world.

CREATE COMMON DATA COLLECTION, MONITORING & REPORTING SYSTEMS, AND GLOBAL GUIDELINES

Develop a common, open source set of global guidelines governing data collection, monitoring, and reporting.

3.

The need to understand and manage water risk

For 10 consecutive years, water is the only risk to have been listed by the World Economic Forum in the top 5 global risks in terms of impact. From physical risks (i.e. countries, cities, companies, supply chains and/or populations face restricted or no access to the water they require), economic risk (i.e. that supply chains, key industrial and agricultural operations are shut down or forced to meet hefty regulatory requirements to mitigate water consumption or treatment), societal risk (i.e. that lack of access to water caused by physical or economic scarcity leads to mass migration, social displacement and war), environmental risk (i.e. loss of watersheds, depletion or pollution of underground aquifers and subsequent impact on agricultural and other supply chains), political, cultural or other water related risks such as health.

Understanding these and other water-related risks, identifying such risks and then being able to assess, understand and mitigate against such risks is critical. It will enable proper assessment of such matters in decision-making and help achieve better planning and investment decisions, forecast-based planning of water risk (such as from drought), and scaling up disaster warnings and recovery efforts.

OUR RECOMMENDATION

Assessing and managing water risk

IMPLEMENT AND DISCLOSE WATER RISK ASSESSMENT

Agree on a common set of criteria for governments, cities, companies and communities to predict, assess and quantify water risk so that early planning can be implemented to accommodate any water shortages and the impact they will have from a physical and economic standpoint. In addition, once assessed, ensure that the findings are disclosed such that investors can assess the water risk and opportunities relating to the companies they invest in – through the use of TCFD.

4.

The need for finance and investment

The latest data shows the cost of solving our water challenge is USD1 trillion per annum, representing varying percentage proportions of national GDPs from 0 to 8%. Mobilising this level of capital at speed will require both the creation of relevant incentive structures to push or pull capital into the water sector, and appropriate mechanisms to identify, quantify and manage water-related risks on all sides of the investment equation.

In the case of climate change, both national and private sector pledges, and the establishment of multilateral funds like the Green Climate Fund, have worked to stimulate investment into renewables and low carbon financial products. Even more so, recognition of the physical and transition risks that climate change now presents have become a key driver for action on climate change, especially in the context of its impact on physical assets.

A critical element in enabling financing will be scaling understanding of the value of water, both from a physical and economic perspective and from a social, environmental, and political perspective. One of the challenges that must be recognised and overcome is that the benefits and returns of investment in water do not always flow directly back to the initiator of that investment or solution. Instead, they may flow to a local community or environmental ecosystem. Accelerating financing hinges upon quantification of these non-financial benefits.

OUR RECOMMENDATION

Accelerate the financing of action on water and investments in technology

MOBILISE CAPITAL FOR WATER

Develop new pools of capital (such as a water equivalent of OGCI or IRENA), an expansion of existing capital (such as water windows within the GCF or GEF), or leverage innovative pricing and market mechanisms to mobilise additional funding for water.

ACCELW AND INFRASTRUCTURE

Accelerate both the commercialisation, scaling and application of existing water technologies and the development of new technologies, including through alternative financing tools such as Blue Basin Bonds, better fostering and scaling of entrepreneurial ideas, and consolidating, prioritising and streamlining project pipelines.

ACCELERATING DEPLOYMENT OF TECHNOLOGY

Explore opportunities to create market-based mechanisms to accelerate the transfer of knowledge and technology within and between at-risk basins.

5.

The need for better water governance: building a basin-based approach

Water catchments often reach far beyond the visible waterlines of rivers and lakes, extending across one or more national boundaries with significant consequences. According to WRI, "water management" amounts to an average of 17% of total costs in addressing global water issues. Water management and governance is not only an issue at a national level – it also has an impact sub-nationally as governments face pressure to manage the supply of water to multiple competing interests (e.g. manufacturers, small-holder farmers, irrigators, generators, municipalities, and domestic homes).

In the case of climate, the shift in the Paris Agreement towards a "bottom up" approach that allows Parties to determine their contribution towards collective action has meant that while there is global commitment to an overall 1.5 °C target, the implementation occurs at a national level through the Nationally Determined Contributions which have become the primary vehicle for climate governance.

Applying this "think global, act local" theory to water governance means emphasising basin-based management systems which allow greater tailoring of appropriate local responses, and more efficient monitoring, measuring and reporting.

OUR RECOMMENDATION

Build basin-based governance & management

CREATE BEST PRACTICE GUIDANCE AND INCENTIVES FOR WHOLE OF BASIN MANAGEMENT

Create a set of best practice guidelines and precedents that incentivise, encourage and support the establishment of Basin-based Governance and Management Systems, particularly focusing on facilitating greater transboundary collaboration between stakeholders in at-risk basins and the potential role of market mechanisms in doing so.

6.

The need to build system-wide resilience

Key to our ability to manage water is to build a resilient ecosystem that can withstand variable water flows, handle changing weather patterns, and provide reliable streams of water where and when it is needed. This requires an understanding of water risk and an ability to consider innovative solutions.

Enhancing existing storage such as reservoirs, increasing storage through investment in nature-based solutions (e.g. forestry and REDD+ projects) or other technology-based solutions, and increasing efficiency through a focus on greater yields per drop of water, campaigns to reduce food waste and remove leakages from pipe and other infrastructure will all help to improve our overall system-wide water resilience by helping to balance both demand for water and the supplies of water available.

Building system-wide resilience can also be accelerated by targeting efforts in least-cost highest impact industries, including within agriculture. Early in the debate on climate change, work was done on a "cost curve" – using data to understand where resources would be best spent to achieve the greatest impact least-cost emission reductions. The curve indicated this was in renewable energy and work started to strategically shift companies, investors and governments away from fossil fuels, which is evidenced in a series of announcements over the last 12 months by CEOs and government leaders of their intention to shift, with many more likely to come.

Water doesn't have this type of cost curve, but it does have access to data which indicates that agriculture is to water what renewables are to climate change – the sector that can deliver the least-cost, highest impact action. Critically, gains in efficiency in agriculture must not result in consistent or increased water usage, these gains should be used to ensure absolute reduction in usage.

OUR RECOMMENDATION

Build system resilience

INTEGRATE ADAPTATION INTO ALL GOVERNMENT PROCUREMENT, DECISION-MAKING, PLANNING AND INVESTMENTS

Ensure all economic and public decision-making, public policy development and public planning and investment decisions take into account the implications for water.

ENHANCE AND IMPROVE WATER STORAGE

Enhance and improve the quality and quantity of existing and new water storage facilities including decentralised storage solutions, nature-based mechanisms (e.g. forests and wetlands), and recharging underground aquifers in order to mitigate against future physical, economic and societal water-related risks.

PROMOTE NATURE-BASED SOLUTIONS

Promote the increased use of nature-based solutions to solve water problems, including developing innovative funding mechanisms to enhance and encourage investment in appropriate water-focused nature-based solutions.

TARGETING LEAST-COST, HIGHEST IMPACT SECTORS BEGINNING WITH AGRICULTURE

Focus global resources and effort first on achieving the least-cost, highest impact results in a specific sector ("picking a winner"), in the case of water – in increasing efficiency in agriculture.

UGAB RIVER, NAMIBIA

Elusive, but ecologically vital, Namibia's Ugab River only flows above ground for a few days each year. The subterranean waters underlying this ephemeral river are shallow enough in places to fill hollows and sustain a wildlife population that includes the rare desert elephant.

Source: Photo by USGS on Unsplash

Conclusion

The growing gap between water supply and demand combined with the broader challenge of meeting the other broader sustainable development goals with respect to water is leading to a global water crisis. Climate change is central to this crisis both as a contributing factor but also in that the history, context and key elements of the approach to climate change, including the international regulatory regime, may provide insights and lessons for the global water crisis, beyond the traditional siloed approach adopted in dealing with water. Set out above, and within this report, are a series of insights and recommendations that can hopefully achieve this. However, it will require all stakeholders to come together in a cooperative and holistic manner, putting aside vested interests and work together to secure global water supplies and rapidly close the Gap.

SAHARA SAND AND DUST

Envisat captures the sand and dust from the Sahara Desert blowing across the Atlantic Ocean along the coasts of Mauritania (top), Senegal (middle) and Guinea Bissau (bottom). Saharan dust plays an important role in the Mediterranean region because it is the major source of mineral nutrients for phytoplankton – the basic food on which all other marine life depends. It is not always beneficial, however. In the Caribbean, Saharan dust is believed to infect coral reefs with the sea fan disease.

Source: Photo by The European Space Agency

1.
Water

Approximately 71% of the Earth's surface is covered by ocean – huge volumes of water that evaporate under the heat of the sun and collect as vapour, condensing into clouds and falling back to earth as rain, snow or ice either to collect into reservoirs, ice-flows, or aquifers, or to run off back into the oceans.

Populations across the world rely on this water cycle for everything from manufacturing to agriculture to the production of energy. It acts as a mechanism to deliver water where it is needed (to crops, dams, reservoirs), as a form of transport (rivers), a way to remove waste (sewerage and manufacturing by-products), a tool to clean or cool equipment (mining), a recreational facility (swimming), a battery storage device (dams), or a way to drive turbines (hydropower). And yet, of all the water on the planet, 96% is salt, and rarely used for most of these functions. Of the remaining 4% freshwater, approximately 3% is locked into ice and glaciers, around 1% is in the ground, with the remainder (less than 0.1%) available to humans, plants, and animals. The remainder of this report will focus primarily on the 4% of water that is fresh. In particular, the less than 0.1% of freshwater that is available for the economies, communities, plants and animals, agriculture, food, and energy on our planet.[1]

Burgeoning demand for increasingly limited supplies of freshwater are causing material water shortages around the world. As climate change continues to severely affect global hydrological cycles, and our population, food and energy requirements, the World Resources Institute forecasts that by 2030, without a wholesale adjustment in the way in which water resources are used and managed, demand for water will exceed supply by 56%.[2]

Furthermore, recognising the critical importance of water, the United Nations Sustainable Development Goals, set out critical goals to help address the water challenges of freshwater, incorporating a range of water goals into SDG6.[3]

Despite, these clear goals, historically, water suffers from a lack of awareness around the severity of the problem. Too often decisions to act come after the water is close to or has run out. There is often a lack

[1] For the purposes of this discussion, we have put to one side the entirety of the discussion around oceans, including ocean contamination and ocean plastics (most of which comes from freshwater rivers). It is important to note however, that rivers and oceans are inextricably linked and therefore where there is a link, for example, for the purposes of discussing desalination, or constraints on water supply from nitrate run-off or other forms of pollution, oceans are discussed in that context.

[2] Achieving Abundance: Understanding the Cost of a Sustainable Water Future by Colin Strong, Samantha Kuzma, Samuel Vionnet and Paul Reig - January 2020, https://www.wri.org/publication/achieving-abundance.

[3] Recognising the critical importance of water, the United Nations Sustainable Development Goals, set out critical goals to help address the water challenges of freshwater, incorporating the following into SDG 6:

- SDG 6.1 – By 2030 achieve universal and equitable access to safe and affordable drinking water for all ("Access")
- SDG 6.2 – By 2030 achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations (drinking water sanitation and hygiene or "WASH")
- SDG 6.3 – By 2030 improve water quality by reducing pollution, eliminating dumping and minimising the release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally ("Wastewater")
- SDG 6.4 – By 2030, substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity ("Scarcity")
- SDG 6.5 – By 2030 implement Integrated Water Resources Management at all levels, including through transboundary cooperation as appropriate ("IWRM")
- SDG 6.6 – By 2020 protect and restore water related ecosystems including mountains, forests, wetlands, rivers, aquifers and lakes ("Natural Ecosystems").

of planning for water shortages. Combined with this is a lack of willpower to act.

Corporates, governments, and others have a crowded agenda, competing priorities – none of which involves solving what is often perceived as being the highly complex challenge of water. Instead, water is relegated to the periphery, and decisions which have a significant bearing on it are made without regard to the water-related consequences. These can include construction of dams, investment in energy-related infrastructure, approval of mines (including access to water), construction of manufacturing services, construction of cities and non-porous road services – a significant list.

To mitigate against this and to ensure the appropriate steps are taken to meet the water challenge, the water sector needs to not only to learn from the lessons of climate, but to recognise the need to work collaboratively. Traditionally beset by siloed approaches, it is not uncommon for the water community to compete not only with other sectors outside, but between themselves. As a consequence, for years conversations have been held within the water echo chamber, failing to engage the energy, food, agriculture, manufacturing, retail, and other sectors – all of which have a significant water footprint.

Water in crisis

Water goes into everything that is used, bought, or consumed – every single day. From the consumption of food to the clothes purchased from a store, or the power that was used to turn on the light or recharge a computer. Water is used to grow the cotton that created the fibres that are used in shirts, jeans, shorts, dresses. Water is essential to growing the wheat for a burger bun, and the grass that was fed to the cow that ended up inside the burger.

Increasing demands on freshwater and depletion of usable freshwater resources are causing water shortages. Right now, 2.8 billion people are affected by water scarcity at least one month each year. Approximately half of the world's population live in countries facing extreme water stress, where more than 80% of the available supplies are withdrawn each year, and an additional one in three live in areas facing high water stress, where more than 40% of available supply is withdrawn every year.

The size of the problem and its consequences are staggering. Twelve out of 17 of the most water-stressed countries are located in areas of the world with high levels of geopolitical instability, and the 13th is India – a country of 1.3 billion people. Ultimately, if water is not managed properly and if the broader issues facing it are not resolved, the consequences will be even more significant. By 2025, experts forecast 1 in 2 of the planet's 9.7 billion people will live in water stressed regions.[4]

The gross imbalance between where we are now, and where we need to be in order to protect and manage our water resources both efficiently and effectively is driven by a range of factors including climate change, poor governance, overuse, population growth, shrinking water towers, poor infrastructure, inefficient water use, a growing demand from industry and agriculture, and pollution.

CLIMATE CHANGE

Increasingly, climate change is having a measurable effect on the global water cycle - altering the amount, distribution, timing, and quality of available water. As the impacts of climate change increase, the water cycle is expected to undergo significant changes, with extremely significant repercussions for communities, economies. and ecosystems around the world. A warmer climate causes more water to evaporate from both land and oceans; in turn, a warmer atmosphere can hold more water. In areas that are dependent on the gradual melting of snowpack to supply surface water through the warm months, this means lower flows and greater water stress in summer. It also means more unpredictable weather patterns, more droughts in some areas and more precipitation in others, and a change in the historical nature of weather patterns - for example, wet areas are expected to become wetter and dry areas drier.[5] At the same time, shifting weather patterns mean that the rain that previously fell into our catchments is now falling elsewhere - particularly into regions that are lacking the infrastructure to capture it. From old reservoirs that were previously full but now lying empty, to increasingly large tracts of land now covered with housing and non-permeable surfaces (meaning the earth cannot recharge its

[4] https://waterfootprint.org/en/about-us/news/news/water-stress-affect-52-worlds-population-2050/
[5] https://www.ucsusa.org/resources/water-and-climate-change

underground water supplies), less and less water is being captured for use. According to data from NASA's GRACE satellite system, which measured for the first time the state of the planet's underground aquifers, more than half of them are depleted beyond their sustainable tipping point. And when it does come, rain is falling in more intense ways – for example, via extreme flooding events. As well as causing damage to infrastructure, floodwaters often contain toxins and other pollutants gathered as the waters run across communities, factories, farmland, and cities. Rather than be available for use, this is rainfall that is rushed out to the oceans. As a result, aquifers and ground water recharge rates are increasingly being challenged to keep up with the rising demand for withdrawals.

GOVERNANCE

Water flowing into a river comes from a variety of sources – upstream flows from water towers, or the drainage basins in the areas surrounding the river itself.[6] In some cases, river systems are contained within a single jurisdiction but may be poorly managed in part because they fail to manage multiple demands that are both long and short term, and from a variety of areas. Furthermore, some 263 of the global river basins cross the borders of two or more countries or cut across state-based boundaries.[7] This cross-jurisdictional nature of river basins makes governance challenging with upstream states often dictating terms of use. For example, competing interests can arise where an upstream country seeks to dam waterways for the purposes of constructing dams for power (like Ethiopia's Grand Renaissance Hydroelectric Project on the Nile) and those downstream (like Egypt) who rely on the steady flow of water for its agricultural production on which its economies and communities rely.[8] Given such challenges there has been a focus on developing transboundary management agreements, integrated water resources management plans (**IWRM**) and other mechanisms to try to both improve water use and management, and do so across these often relatively contentious international or domestic boundaries. One of the highest profile examples of these is the UNECE Water Convention – a legal framework designed to support and promote transboundary cooperation. Originally open only to European Countries, since 2003 it has been globally available. It has been the topic of much conversation, but still two-thirds of the world's transboundary rivers do not have cooperative frameworks.

AGRICULTURAL DEMAND

The single biggest user of water is and will remain in agriculture. Across the world on average, 70% of water withdrawals are used for agriculture (compared with 20% for manufacturing and 10% for domestic household consumption). By 2025 this is expected to increase by 60%.[9] Of all cultivated land, the 20% that is irrigated provides 40% of the total food produced worldwide.[10] With increasing pressure on water resources, and increasing demand for food, textiles and energy, competition for existing water supplies is going to increase dramatically, with a greater emphasis on measures such as GDP or Crop per Drop.[11] In this regard, decreasing water demand and use in agriculture will have a dramatic impact on the global water supply. There are a number of measures already being considered for adaptation of the agricultural sector to the challenges associated with lower access to water resources, either through constraint of competition or climate change. One of these is the "Global Framework for Action to Cope with Water Scarcity in Agriculture in the Context of Climate Change" (**WASAG**), established in 2017, by the Food and Agriculture Organisation of the UN (**FAO**). A partnership of government agencies, civil societies, research institutions and international organisations, its goal is to identify and deploy policies and programs that will improve and adapt agricultural systems in conditions of water scarcity and changing climatic conditions. Finally, WRI has estimated that 73% of the global water scarcity gap could be closed by agriculture if it achieved only a 20% efficiency improvement. Delivering this outcome would cost only 38% of the total funding required to close the gap. As such, focusing on delivering significant water savings in agriculture makes both financial and practical sense. Critically, efficiency improvements in agriculture must not be seen as the panacea for agricultural water use. Research has shown that in isolation, irrigation efficiency can lead to more, rather than less, water being extracted at the catchment and baseline scale. Instead, efficiency targets should be combined with consideration of

[6] http://riverbasins.wateractionhub.org
[7] The Nile runs through Egypt, Sudan, South Sudan, Eritrea, Ethiopia, Kenya, Democratic Republic of the Congo, Burundi, Rwanda, Uganda and Tanzania, while the Colorado draws its waters from Arizona, California, Colorado, New Mexico, Nevada, Utah and Wyoming
[8] https://www.power-technology.com/projects/the-grand-renaissance-hydroelectric-project/
[9] https://www.nature.com/articles/s41545-019-0039-9
[10] https://www.worldbank.org/en/topic/water-in-agriculture
[11] http://www.fao.org/english/newsroom/focus/2003/water.htm

setting some form of basin level absolute reduction (or sustenance) targets in order to properly address over withdrawal.

SHRINKING WATER TOWERS

Climate change and activities such as the degradation of landscapes and global deforestation are having a dramatic impact on global water supplies. Approximately half of all the freshwater we use is sourced from glaciers, ice and snow located high in the mountains and forests. These "water towers" provide water for 40% of the world's irrigation, and 80 to 100% of the total run-off of river basins in arid and semi-arid areas.[12] They provide water for food, for energy, and for almost 1.9 billion people who live in, or directly downstream of, these mountainous areas.[13] For example, in the case of the Indus, more than 200 million people located in the river basin across India, China, Pakistan, Afghanistan, Nepal and Kashmir rely on its waters. Water towers effectively act like "banks", storing water resources and supplying water for downstream needs through the flow of rivers. Increasingly, climate change is putting pressure on these resources, causing decreased snow-packs, glacial retreat, and less water to be stored in natural "banks". In places like the Himalayas, mountain temperatures have increased by almost 2°C over the last century. The consequences of shrinking water towers are significant. Water is one of the main sources of energy production in mountain regions[14] and water from glacial melt supports major cities like Lima, which relies completely on water flowing down from the Andes. Economically, water towers are significant – 18% of global GDP is generated in basins dependent on water towers. This issue is not isolated to Asia, or to Africa – it affects all of us living in river basins whose headwaters come from the mountains, or those of us that use products that are grown and produced in those basins. That includes the Fraser River in British Columbia and the Rhone and Po in France, Italy, and Switzerland. Water towers are critically important, not only in achieving water security, but also in growing food, and in generating hydro energy. Any shift in the water resources banked in water towers therefore fundamentally impacts people's lives, societies, and economies.

FORESTS AND DEFORESTATION

While it is well known that carbon dioxide emissions from deforestation are a major contributor to global warming, the world's forests also regulate global hydrological cycles. Approximately 10% of the atmosphere's water vapour comes from transpiration – the process of releasing vapour through the leaves of trees during their growing cycle.[15] When enough vapour is released, clouds form and rain falls. In some cases, wind can move these clouds or "flying rivers" from rainforests thousands of kilometres to eventually provide rainfall somewhere else entirely.[16] As global rates of deforestation increase this hydrological cycle, we risk these aerial rivers and the lands that depend on them for rain. A growing body of research suggests that deforestation could in many continental interiors dwarf the impacts of global climate change. It could dry up the Nile, severely damage the Asian monsoon, and decimate fields from Argentina to the Midwestern United States.[17] In addition, large-scale deforestation in any of the three major tropical forest zones of the world – Africa's Congo basin, southeast Asia, and especially the Amazon – could disrupt the water cycle sufficiently to "pose a substantial risk to agriculture in key breadbaskets halfway around the world in parts of the U.S., India, and China".[15] All of these impacts play out intensively at local and regional scales. Finally, healthy forest cover also assists with flood and soil protection. When trees are removed, water discharge increases and the risk of flooding in high rainfall areas and drought in lower rainfall zones increases. In many cases, forests are used as a buffer against extreme weather events. In areas of high salinity, deforestation can cause the groundwater tables to increase, increasing the rise of salinity – often allowing the visible appearance of salt on the surface of the soil. The Shiga Declaration on Forests and Water, made in 2002, created one of the first frameworks for action. Since then, much has been done to understand the forest-water linkages better. In 2018, when the SDGs were released, target 6.6 specifically recognised forests as water-related ecosystems stating, "by 2020 protect and restore water-related ecosystems including mountains, forests, wetlands, rivers, aquifers and lakes". Nonetheless, the critical linkage between climate, forests and water needs to be better understood.

[12] http://www.fao.org/fileadmin/templates/mountain_partnership/doc/Mountains_and_the_SDGs.pdf
[13] https://www.nature.com/articles/s41586-019-1822-y
[14] http://www.fao.org/fileadmin/templates/mountain_partnership/doc/Mountains_and_the_SDGs.pdf
[15] https://www.usgs.gov/special-topic/water-science-school/science/evapotranspiration-and-water-cycle?qt-science_center_objects=0#qt-science_center_objects
[16] Rivers in the Sky: How Deforestation Is Affecting Global Water Cycles https://e360.yale.edu/features/how-deforestation-affecting-global-water-cycles-climate-change
[17] Michael Wolosin And Nancy Harris, Ending Tropical Deforestation: A Stock-Take Of Progress And Challenges, Tropical Forests And Climate Change: The Latest Science, WRI Working Paper, June 2018, https://wriorg.s3.amazonaws.com/s3fs-public/ending-tropical-deforestation-tropical-forests-climate-change.pdf

PIPES AND INFRASTRUCTURE LOSSES

In many cities and towns, water supplies are challenged by poor water management resulting in inadequate investment in infrastructure such as leaky pipes and new reservoirs and catchments, failure to implement appropriate recycling and reuse, and either poor water allocation or water allocation which fails to take into account changing weather conditions. In some cases, estimates are that distribution losses can reach up to 50% if left unmanaged and unchecked.

780 MILLION

People do not have access
to improved water sources

POLLUTION

Pollution decreases the amount of freshwater available for use in factories, agriculture, cities, and communities. Pollution can occur in a variety of ways, either through flooding events which cause significant run-off, collecting contaminants and carrying them into rivers, reservoirs or underground aquifers. In the case of the recent dramatic fire season in Australia, significant rainfall following the fires carried fire retardant, soot and other pollutants into reservoirs, contaminating water sources already under pressure from an extended drought period. Contaminants flow into our waterways as a by-product of manufacturing (e.g. textile dying), of farming (e.g. animal effluent and nitrogen by-products from fertilisation), of production (e.g. plastics) and of general human living (e.g. household waste and other matter). Just 10 of the world's rivers are responsible for 90% of the plastics in the ocean – 8 of which are in Asia: the Yangtze, Indus, Yellow, Hai He, Ganges, Pearl, Amur, Mekong, and two in Africa: the Nile and the Niger. In the United States, 40% of rivers and 46% of lakes are so polluted they are unsuitable for fishing, swimming, or any other activity. In high income countries like the United States, approximately 70% of wastewater is treated. Compare this with 38% for upper middle income and only 8% in low income nations. In Singapore and in San Diego, citizens drink recycled water, and in Jordan and Israel, 90% and 50% of agricultural water respectively is recovered for reuse. Finding solutions to clean or process these waters would provide a significant alternative source of water supplies.

Even where water is available it is not always clean, causing real challenges in the provision of drinking water, and basic sanitation and hygiene ("WASH"). Around the world, approximately 780 million people do not have access to improved water sources,* and just over one-third of the world's population lacks access to improved sanitation.^ The vast majority of these are people living in rural areas. Poor water quality is also linked to major health issues in many places around the world where unsafe drinking water is causing more than 2000 children under 5 to die from diarrhea every day. Trachoma, Guinea Worm Disease, Schistosomiasis are all prevalent in areas with unsafe drinking water, poor sanitation, and insufficient hygiene practices.

Woman washing her hands in the heavily polluted waters of the Paranaque River, Manila, Philippines.

*World Health Organization and UNICEF. Progress on Drinking Water and Sanitation: 2012 Update.
^Prüss-Üstün A., Bos, R., Gore, F. & Bartram, J. 2008, "Safer water, better health: costs, benefits and sustainability of interventions to protect and promote health"

Challenges ahead

As demand increases, water resources will continue to shrink. In the Aral Sea, poor water management has meant that what was previously the 4th biggest inland ocean in the world is now less than 10% of its size – this, despite warnings by scientists that the continued withdrawal of such large volumes of water for cotton and rice production would yield this result. They are not the only ones – similar warnings have been given by scientists at the Great Salt Lake in Utah, USA, and Lake Urmia in Iran. Like the Aral Sea, those warnings have been ignored.

Across the world, towns are running out of water – from Cape Town which faced down Day Zero in 2018, to Chennai which ran out of water in 2019, and towns like Stanthorpe in rural Australia which relies on trucks to bring water for its survival. More towns are forecast to be facing similar crisis points as the World Resources Institute has identified 17 cities that are at extreme level of water risk, meaning significantly likely to run out of water in our lifetime.

Physical and natural infrastructure is collapsing. This is not just a city-based problem – in agricultural communities across the world farmers are struggling to survive through extensive drought, or inadequate supplies of groundwater. In California, significant subsidence of the land has been caused by the over-withdrawal of water from the underground aquifers leading to the collapse of roads and, in some cases, infrastructure. Similar examples exist in Mexico City where the city is sinking and streets which were previously flat, now bear the physical signs of the changing water use.

At a more macro level economies are suffering. These issues are not isolated – they have both economic impact for the affected communities as well as psychological impact. Without their crops, farmers have no income. Families leave their homes and schools and shops are forced to close. Without water security, properties devalue. In the face of all of this, farmer suicide is very sadly increasingly common. The trickle-down effect of these issues can be significant, particularly where entire supply chains are affected. In the United States, the biggest contributor to their water scarcity challenge is agriculture. The major component of this is the production of corn – a sector predominantly owned and managed by two major multinational corporations. The potential impact of changes to corn production or regulations on pricing and valuation of those corporates, on long-term employment and on the investments corporates have in them, is significant. In the Middle East and North Africa, home to 12 of the 17 most water scarce countries in the world, the World Bank estimates economic losses from climate related water scarcity to reach 6-14% of GDP by 2050.[18]

Finally, water conflict is rising. Recently, in 2017, the UN found that 53 of the world's conflicts were water related. That number is increasing dramatically as water is weaponised, fought over and triggers disputes in places from California to Somalia where droughts and deteriorating livestock prices have provided incentives for armed groups like Al Shabaab to recruit fighters with the offer of cash revenues. In 2000, the privatisation of drinking water in Cochabamba led to violent protests which led to the deaths of nine people in what was known as the "Water War of Cochabamba". Water can be used as a tool for peace or for conflict, weaponised to recruit or harm, or used as a tool of control. Governments have been known to withhold access to water, to leverage the desperation amongst communities for revenue following a drought, or to specifically target water infrastructure (like dams or reservoirs) during wartime engagement. With increasingly scarce water resources, and an increasing demand for them, forecasts are that the increase in water-related conflicts will continue to rise dramatically.

The Earth is facing a major water crisis – one which has major consequences that extend far farther than we understand or realise, and which will impact all of us in ways we have not yet fully appreciated. In order to find solutions, we must look beyond the traditional siloed approach, including applying some of the lessons learnt from managing climate change.

[18] https://www.wri.org/blog/2019/08/17-countries-home-one-quarter-world-population-face-extremely-high-water-stress

GULF OF MEXICO, FLORIDA, USA

Looking like a NASA close-up of Jupiter, this image reveals sediment in the Gulf of Mexico off the Louisiana coast.

Source: Photo by USGS on Unsplash

2. Broad insights for water from the approach to climate change

Over the last 30 years the international community has built a global international climate change law and policy governance regime commencing with the 1992 United Nations Framework Convention on Climate Change (UNFCCC).

This framework has been critical for bringing together and driving international effort on adopting commitments to address climate change and to set the ambitions to lower both annual carbon emissions and consequently, total atmospheric concentrations of greenhouse gases. It has also supported significant engagement by non-governmental organisations and businesses driving measures that reduce greenhouse emissions and invest in measures and activities that drive efforts to move the global economy to net zero emissions. Over the last few years increasing pressure by investors, shareholders and financial regulators have accelerated action on climate change through driving a shift of capital and investment away from activities that contribute to climate change toward areas of the economy that will assist with decarbonisation, in particular new/renewable energy, transport and forestry.

While water has always been understood to be an area that will be impacted by climate change, water never emerged as a core area of focus, but rather has been managed outside of the climate change debate. As such, many of the approaches to climate issues have not been adopted with respect to water, despite the benefits of doing so. There is an opportunity to ensure that water learns from the approach to climate change and has a greater focus going forward and is considered in a more holistic way.

Climate change has always been approached as a global issue that is multidimensional and complex. While there is no doubt that the impact of climate change on water and weather patterns is well understood, the treatment of water has remained largely separate. When considering what lessons emerge from the approach to climate for water, the following initial insights emerge as useful to frame the recommendations in this report.

SPEED IS KEY

The global water crisis is evolving extremely rapidly, 4.2 billion people lack access to safe sanitation, and 3 billion people lack basic handwashing facilities. From a scarcity perspective, our consumption of water is increasing at twice the rate of our population and 25% of the global population lives in countries experiencing high water stress. On the environmental side, 83% of freshwater species populations are collapsing and wetlands are disappearing three times faster than our forests. We do not have sufficient time to replicate the three decades of climate change negotiations and conventions. Therefore, any recommendations need to provide for a dramatic acceleration of progress.

WATER IS ABOUT MORE THAN SUPPLY AND SCARCITY

Water underpins numerous outcomes for the environment and people, acting as the lifeblood for communities, supporting ecosystems and providing habitat for plants and wildlife. It holds significant cultural and spiritual value, particularly for indigenous communities. It includes issues around water quality, sanitation, and management, and has the power to fundamentally change the lives of people around the world. Women and girls spending hours each day walking to fetch water from wells or often contaminated rivers instead of attending school. Rural farmers living downstream from major dams relying on another nation to release the water they need to sustain their crops they live on. Communities in towns where poor management or inadequate investment in infrastructure means that there are insufficient water resources to sustain the population and instead of going to work, they line up in the street waiting for water tankers to deliver water. Fishermen who live on the edge of a desert that was once a sea flourishing with the fish they relied on for their living – a sea they literally watched for 30 years retreat from the shorelines as irrigators and others upstream used the water for cotton and rice (amongst other uses). These are people, communities, and economies relying on water for their existence. Water is not just about supply and scarcity. Water is life.

GLOBAL VS BASIN

Whilst climate change governance is based upon international and global governance frameworks, agreements and institutions; good governance and management outcomes for water relies on a basin level management approach, despite the complexities this may have with the redrawing of boundaries away from physical land-based constructs like fence lines and in many cases national borders, it has significant advantages. These include enabling targeted goal setting linked to the water resource, measurement and monitoring systems that allow ongoing reporting on the health of the basins and corresponding adjustments on an "as needed" basis. Like climate change, this basin-based approach will require the management of multiple stakeholders to achieve common targets. The one exception to the basin-level approach is in communication and campaigns around the water challenge where both the global nature of supply chains, and the commonalities of issues across multiple jurisdictions, means that campaigns designed to raise awareness of the global water crisis, for example, need to be run at a global level.

EXISTING VS NEW

There are a large number of well-established organisations, collaborations and ideas in the water sector, many of which have been endorsed and enjoyed the participation of corporates, governments and in some cases multilateral institutions. Given the speed at which water risks are impacting our communities, supply chains and our economies, rather than recommend creating an entirely new system of governance mechanisms, our view is that where possible we should maximise, leverage and expand on what already exists.

NEXUS

When reaching any conclusions, consideration needs to be given to the strong nexus between water, climate, energy, food, economy, and all other aspects of the Sustainable Development Goals. Water is uniquely connected to each of these, and therefore decisions related to water (and the other areas) cannot be made in isolation but must consider the full breadth of interconnectedness between these issues.

TECHNOLOGY TRANSFER AND CAPACITY BUILDING

The climate regime's focus on developed countries sharing technology and assisting with capacity building of developing countries has been a key element of accelerating their shift to low carbon economies. In the case of water, a similar premise could apply to climate-smart agriculture[19] including by targeting improved water efficiency, water treatment and water reuse technology to

[19] NZ have incorporated this into their aid program.

key water-starved basins. These basins would be prioritised according to where the human and ecological risks are most acute, and where transfer of technology (particularly in upstream situations) can also support improved basin management and greater downstream flows.

QUALITY VS QUANTITY

Unlike greenhouse gases, water is considered a resource to protect and create more of. There are multiple ways in which to do this – from support to technology, to pulling water from the atmosphere, to differentiating water use based on the quality of water available, as well as better approaches to storing water. Recommendations on water should therefore take into account opportunities to leverage both technology and policy-based solutions in order to support a water management system that efficiently balances the need for quantity (e.g. for sanitation) and quality (e.g. for human consumption).

EQUITY

Water is not bound by national or sub-national boundaries, and its availability cannot always be bought. In the case of transboundary management like the Nile or the Mekong where multiple states access shared water resources, this can create tension between upstream, naturally water resource rich countries, and those downstream who depend on others in the basin to provide them with the water they need for economic growth and continued social stability. Within countries, governments face pressure to manage the supply of water to multiple users – including farmers and irrigators, manufacturers, commercial users, cities, and domestic homes. Within each of these user segments there often lies complex considerations about satisfying the global right to water, particularly for small-holder farmers and the urban and rural poor. Meeting such competing needs, in what are often political fragile environments, requires the application of principles of fairness and equity that reaches far beyond pure economic impact.

SINGLE VS MULTIPLE APPROACHES

The water sector is large and involves what are often complex relationships with various aspects of our economies and our societies. Rather than attempt to unify around a single approach to solving water problems, we need to learn from climate change where the single-solution approach failed, and instead look at how the same goal can be achieved through multiple different solutions.

Farmer, Ninh Binh, Vietnam.

[19] NZ have incorporated this into their aid program.

SANDBANKS IN THE WADDEN SEA, NETHERLANDS

This satellite image shows the ever-moving sandbanks in the shallow Wadden Sea in the north of the Netherlands. Declared a UNESCO World Heritage Site in 2009, this unique region is one of the largest wetlands in the world. As this satellite image shows, the sandbanks are bordered by relatively deep channels and gullies, which provide a route for boats crossing between the islands and mainland.

Source: Photo by The European Space Agency

3. Science and data

Established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the IPCC was formed to provide governments at all levels with scientific information that they can use to develop climate policies.

With 195 members, including the world's leading climate scientists, IPCC scientists volunteer their time to assess the thousands of scientific papers published each year to provide a comprehensive summary of what is known about the drivers of climate change, its impacts and future risks, and how adaptation and mitigation can reduce those risks. These papers are then turned into a comprehensive report on the state of climate science, based on an open and transparent review by experts and governments around the world. It is an essential part of the IPCC process to ensure an objective and complete assessment and to reflect a diverse range of views and expertise. Through its assessments, the IPCC identifies the strength of scientific agreement in different areas and indicates where further research is needed.[20] This creates a wealth of critical data and information that are a key input into international climate change negotiations.

Since it was established, the IPCC has published five assessment reports in addition to a number of special reports, one of the most significant of which was a special report on global warming of 1.5 °C – a report which led to the adoption in the Paris Agreement of the 1.5 °C target. The role of the IPCC in consolidating data and information has been pivotal to the evolution of the climate movement, coalescing a multitude of climate scientists around a common position, articulating priorities for action, and using data as a platform to initiate public discussions on key issues.

Without an equivalent to the IPCC, water is missing a comprehensive, agreed set of science and data that represents a collection and analysis of the state of water globally, making recommendations that attract media attention and focuses policymakers and conversations on the steps that need to be taken to address identified issues.

There is sophisticated data collection being undertaken and disseminated. This includes WRI through its Aqueduct tool, WWF's Water Risk Filter, WBSCD's India Water Tool, NASA through its GRACE satellite mapping system, AQUASTAT, a UN Food and Agriculture Organisation tool for water and agriculture, and the Transboundary Waters Assessment Programme, which provides baseline assessment to identify changes in transboundary water systems. In addition, there are publications like the Pacific Institute's biennial publication "The World's Water" and UN World Water Development Reports. However, the challenge is that there are currently a number of organisations that assimilate data and current data sources are piecemeal and not systematically referenced or coordinated at a strategic, global level. What is missing is a **universal**, centralised system that is accessed by all so that data relied on is consistent and disclosure on water risk assessment and management are more comparable. In addition, while numerous reporting requirements exist on water – from those specific to the sector (e.g. the Water Disclosure Project; GRI 303:

[20] https://gca.org/global-commission-on-adaptation/adapt-our-world

Water and Effluents 2018), to others in which water is embedded in the other metrics being reported (e.g. Sustainable Apparel Coalition) there is no universal MRV system for water or industry approach like the WRI GHG Protocol.

LESSONS FOR WATER

Established just prior to the UNFCCC, the IPCC has played a critical role in helping to coalesce climate science into regular reports that provide important inputs to the climate negotiations. Whilst not responsible for conducting its own research, the substantive insights, reviews and discussions on existing climate science and key trends have been instrumental in shaping the international approach to climate change. The IPCC has been invaluable not only for providing a focal point for scientists and scientific experts, but to identifying key themes, highlighting issues and bringing attention to the nature and severity of the problem, and the consequences of failing to find solutions. In addition, there are a multitude of multilateral developments and international organisations that support the IPCC and have a core focus on climate change or have been set up to manage climate change or energy.

Without an equivalent to the IPCC or dedicated multilateral development and international organisation, water is missing a comprehensive, agreed set of science and data that represents a collection and analysis of the state of water globally, makes recommendations that attract media attention and focuses policymakers and conversations on the steps that need to be taken to address identified issues. Instead, water has been addressed on a much broader level, often by setting up small, siloed, water-focused groups within those institutions. Creating an IPCC equivalent framework for water would be an extremely lengthy and time-consuming process, if achievable at all.

Consideration should be given to including water in an individual country's greenhouse gas inventories under the UNFCCC and/or embedding water in the risk assessment for climate risk under the Task Force on Climate-Related Financial Disclosures (TCFD) so as to not create a new disclosure body. The data collected under this common regime could also form the basis of the information analysed by entities trying to coordinate the overall science of water. This would require creating a common set of metrics for water reporting and a protocol for what and how water is measured that would then enable governments and organisations to create lists of "needs" and then improve their access to potential funding and support (for example, to strategically identify needs for measurement and monitoring devices and others).

It is worth noting that unlike climate science which has an evidentiary apex, there is no unifying scientific theory for water. The hydrological differences within and between basins mean that water-based data is much more granular. Despite this, there are three critical elements of water data that could assist stakeholders, particularly companies, to better understand and therefore manage water resources sustainably: 1) near real-time data for baseline water stress; 2) near real-time data for water quality; and 3) a standardised tool for companies to manage risks identified in steps 1 and 2. The combination of these data points would enable companies, in particular those with global value chains, to better understand their water risk and impact and therefore implement better strategies to address those risks and impacts. An additional intermediary step may be to undertake a process of mapping the various conventions, UN agencies, sub-committees, global and regional development banks, and other organisations to map their interplay and understand how existing data could be unified.

In addition, a more rapid response is needed that (a) works with existing institutions and major players in the water area to develop a common understanding of the science and to provide consolidated policy recommendations based on that science; and (b) builds on the data and information available via climate science, for example, rainfall and evaporation rates. Preference should be given to identifying an existing, highly respected institution such as WRI (which already manages both the Aqueduct Project and the Global Commission on Adaptation[21] as well as Forest Watch[22]) to act as a convenor for this type of work. In addition, through this process some goal or "North Star" for water, equivalent to keeping a global temperature rise to "well below" 2°C above pre-industrial levels and "to pursue efforts" to limit the temperature increase even further to 1.5 °C could be established.

[21] https://gca.org/global-commission-on-adaptation/adapt-our-world

[22] https://www.globalforestwatch.org/

OUR RECOMMENDATION

Achieving a universal scientific position on the status of freshwater

CONVENE A MULTI-SECTORAL, PUBLIC-PRIVATE WORKING GROUP LED BY WRI TO ESTABLISH AND PUBLICLY REPORT ON A UNIVERSALLY SHARED SCIENTIFIC UNDERSTANDING ON THE STATUS OF FRESHWATER AROUND THE WORLD.

THIS REPORT SHOULD:

- include consultations with key stakeholders including scientists, academics, and established institutions with access to significant water data, indigenous communities, and others with local historical knowledge of water resources;
- set out the "state of play" for freshwater resources around the world;
- consolidate and build upon existing climate science and data, particularly regarding rainfall and evaporation patterns;
- act as the repository for key data representing the current status of freshwater globally, including identifying and tracking key risks, withdrawal and recharge rates;
- identify current and emerging trends in water;
- act as a catalyst to highlight the risks and issues associated with availability and access to freshwater;
- recommend further action on specific issues, including potential policy and corporate action; and
- explore and leverage new technologies, to deliver improved, real-time data and information that supports a greater understanding of water resources available, replenishment rates and creates a set of commonly agreed, timely data reference points.

OUR RECOMMENDATION

Creating common data collection, monitoring & reporting systems and global guidelines

DEVELOP A COMMON, OPEN SOURCE SET OF GLOBAL GUIDELINES GOVERNING DATA COLLECTION, MONITORING, AND REPORTING.

THESE GUIDELINES SHOULD:

- leverage the expertise of stakeholders, including corporate water leaders, technical specialists, policy and financial institutions, indigenous communities and relevant non-profits;
- utilise the existing mechanisms used to gather, measure and report on available water resources and water use. For example, consideration should be given to including water in an individual country's greenhouse gas inventories under the UNFCCC and/ or embedding water in the risk assessment for climate risk under the Task Force on Climate-Related Financial Disclosures (**TCFD**) so as to not create a new disclosure body.
- create a common, systematic approach for monitoring and reporting on water that can be applied at a Basin Wide level, managed by Basin Management Organisations (see below) and that includes a clear outline of what to measure and how it should be measured, monitored and reported in order to ensure commonality of shared data;
- develop an open source platform designed to be used by decision-makers responsible for water management, for sharing of best practices in data collection, water management and allocation, pricing systems, and technology, and which is managed by an independent third party (for example apolitical/other);
- survey and catalogue all land-based measurement technologies currently being used and under development that are capable of collecting data on land and water. This includes AI, gamma, satellite, drone, and other new technology that measure water tables, use v recharge rates, evaporation, storage capacity and status and other issues related to the current state of the planet's water supplies; and
- assess opportunities for alignment with broader tools such as risk assessment and the approach recommended by the TCFD.

LAKE MALAWI, GREAT RIFT VALLEY

One of the world's few ancient lakes, Lake Malawi, also known as Lake Nyasa, is the third largest lake in Africa. These deep (750 m), isolated waters have shaped a unique diversity of fish that is popular amongst aquarists. Lake Malawi National Park (at the southern end) was designated a Natural World Heritage Site in 1984, with its importance for the study of evolution being compared to that of the finches of the Galapagos Islands.

Source: Photo by The European Space Agency

4. Governance & resource management

Water is not bound by lines drawn on a map or fence lines between neighbours. In fact, water catchments often reach far beyond the visible waterlines of rivers and lakes.

This brings added complexity when those borders extend across national boundaries as is the case with rivers like the Nile, the Mekong, and the Indus. This is not a small issue - 286 River basins around the world run across one or more national boundaries. Whilst the UN's Transboundary and International Watercourses Conventions have created management guidelines, they lack the type of incentive required to bring parties to the negotiating table, and to enforce the type of arrangements required, and over two-thirds of the world's shared river basins do not have any management framework.[23] As water becomes scarcer, and both the overall demand and the number of competing demands (e.g. for hydropower) increase, the potential for conflict also rises. In 2017 the UN found 53 of the world's conflicts were water related.

In addition, within water basins and within countries, governments face pressure to manage the supply of water to farmers and agricultural users (e.g. irrigators), manufacturers, commercial users, cities, and domestic homes. Within each of these user segments often lies a set of complex considerations about satisfying the global right to water, particularly for small-holder farmers and the urban and rural poor. Management of these freshwater sources has economic, pricing and financing consequences also – WRI listed "Water Management" as one of the cost centres for every nation in addressing global water issues, amounting to an average of 17% of total costs. Outside of these user segments, and often not adequately acknowledged or managed, are the environmental, cultural, and spiritual rights associated with water, which have been harder to quantify and value.

Successful long-term management of water requires thinking outside traditional fence lines and borders. Where catchments cross sub-national or national boundaries, their management requires all stakeholders to engage in discussions regarding governance, use and allocations (amongst others). Where one state has access to upstream water, negotiations by their nature exist with a power imbalance – the upstream nation holding access to the water. The small number of multi-state transboundary agreements that exist is evidence of the complexity of managing these issues, particularly across borders where political tension already exists. Carefully designed incentive structures are also needed to facilitate greater uptake and implementation of whole-of-basin management approaches which may mean real valuing and pricing of water.

[23] http://www.siwi.org/priority-area/transboundary-water-management/

Climate governance legal frameworks

The global framework of international law that governs climate change is based upon the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement, all of which have taken three decades to progress. It is further supplemented by the IPCC (discussed in the previous chapter) and domestic laws that implement the objectives of these international frameworks.

THE UNFCCC & A TOP-DOWN APPROACH

In 1992, countries joined the United Nations Framework Convention on Climate Change (**UNFCCC**)[24] - a top-down framework for international cooperation to combat climate change.[25] Under the provisions of the UNFCCC, the international community agreed differentiated responsibilities and assigned targets based on them. Importantly, the UNFCCC also institutionalised the mechanism to report and track progress against the collective action goals by requiring all countries to submit annual greenhouse gas inventory reports – a practice which continues today.[26] The UNFCCC also provided a commitment by industrialised countries to share technology and, through the creation of a financial mechanism, to support climate change activities in developing countries above and beyond international support already being provided.[27] The approach to technology transfer and financial support remains a critical element of global climate governance and continues to evolve.

THE KYOTO PROTOCOL & COMMON BUT DIFFERENTIATED RESPONSIBILITIES

Realising the limitations of the UNFCCC, in 1995, countries launched negotiations to strengthen the global response to climate change and, two years later, adopted the Kyoto Protocol.[28] Under the principle of "common but differentiated responsibility and respective capabilities", the Kyoto Protocol puts more of the onus of mitigating greenhouse gases on developed countries and includes binding emission reduction targets for Annex I parties. The Kyoto Protocol also allows Parties to use flexible market mechanisms in the form of international sovereign-to-sovereign emissions trading: the Clean Development Mechanism (**CDM**) and Joint Implementation (**JI**).[29]

THE PARIS AGREEMENT, LOCAL COMMITMENTS & A GLOBAL TARGET

Ten years after the entry into force of the Kyoto Protocol, the Paris Agreement, adopted in Paris on December 12, 2015, became the latest step in the evolution of the global climate change regime.[30] The Paris Agreement marked a fundamental shift in global climate governance from the top-down approach first established under the UNFCCC and enhanced by the Kyoto Protocol, to a "bottom-up" approach whereby all Parties determine for themselves what their contributions to the collective action will be via their Nationally Determined Contributions (**NDCs**). This shift was viewed as the best means to encourage developing countries, many of which have become major emitters in their own rights over the course of the last quarter of a century, to directly contribute towards the collective emission

[24] UN General Assembly, United Nations Framework Convention on Climate Change: resolution / adopted by the General Assembly, 20 January 1994, A/RES/48/189 ("UNFCCC").

[25] By mid-1993, the UNFCCC had been signed by 166 parties and entered into force in 1994. See UNFCCC website, UNFCCC Status of Ratification of the Convention, UNFCC Article 4(8), (https://unfccc.int/process-and-meetings/the-convention/status-of-ratification/status-of-ratification-of-the-convention) (accessed January 19, 2020). Currently, there are 197 parties (196 states and one regional economic integration organization) who are parties to the UNFCCC, demonstrating its near-universal acceptance. Id. The fact that the UNFCCC set forth only the framework for cooperation and not hard emissions targets assisted in its rapid approval and entry into force.

[26] UNFCCC, Article 4.

[27] UNFCCC, Article 4(8).

[28] Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 2303 U.N.T.S. 162

[29] The idea behind these mechanisms was to allow for the most efficient and cost-effective emission reductions globally with the understanding that a location of a reduction in greenhouse gas emissions is irrelevant to the impact on the global climate. The CDM in particular encouraged emission reductions in developing countries that did not have an emissions reduction target under the Kyoto Protocol but could nonetheless host emission reduction projects and receive financing in return. Under the CDM, emission reduction projects can earn tradeable certified emission reduction (CER) credits, each equivalent to one tonne of reduced or avoided CO2. CERs could then be used by countries to meet their Kyoto Protocol emission targets. The trading programs also allowed some leapfrogging of technologies to the extent new, cleaner technologies that reduce emissions in developing countries could be supported by the CDM. The incentive created by the CDM has catalysed the registration of more than 8,100 projects and Programmes of Activities in 111 countries and has led to the issuance of over 2 billion CERs. By hosting CDM projects and involvement in carbon transactions also resulted in raising the capacity of developing countries related to carbon markets and climate solutions.

[30] The Paris Agreement entered into force in November 2016 after a lightning-fast ratification. Currently, the Paris Agreement has 195 signatories and 187 parties.

reduction targets. Additionally, by embedding a periodic review and revision process for NDCs, the Paris Agreement is set up as an enduring agreement that can evolve and adapt to the science and collective ambition needs over time.

The aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping a global temperature rise to "well below" 2°C above pre-industrial levels and "to pursue efforts" to limit the temperature increase even further to 1.5 °C. By mid-century, the Paris Agreement envisions a net-zero emissions world in which global sources of emissions and sinks are equal. In addition, Article 6 of the Paris Agreement[31] provides for the international trade of eligible offsets. Article 6 establishes a framework that facilitates voluntary cooperation between countries in the implementation of their NDCs to allow for higher ambition in countries' mitigation and adaptation actions and to promote sustainable development and environmental integrity. Article 6.2 sets forth the ability for countries to trade "internationally transferred mitigation outcomes" or "**ITMOs**" while Article 6.4 establishes a "sustainable development mechanism" that will be centrally managed by the COP and allow trading of certified credits.[32]

Ultimately, to achieve emission reductions of the scale required, especially given the NDC construct, measures adopted by national governments under domestic law, rather than under international law, are critical. In short, action is required on the ground where the actual emissions are occurring and the impacts of climate change are happening. In many countries, domestic legal regimes have been developed that place a limit on the emissions that those entities that they regulate can emit - and then place a cost or "price per tonne" of carbon dioxide equivalent emitted. This may take the form of a carbon tax or an emissions trading scheme (**ETS**), also often referred to as a "cap and trade policy". For example, the EU Emissions Trading Scheme and more recently Colombia's carbon tax[33], both work to reduce the national levels of emissions and in doing so have driven meaningful behavioural change and financial flows towards climate solutions.

Broader stakeholder governance

Building upon the role of the UNFCCC system and those programmes adopted by national governments, a range of other actors have also been highly active in shaping the global response to climate change.

Multilateral Development Institutions, namely the World Bank, the International Finance Corporation, the Asian, African and Inter-American Development Banks and the European Investment Bank (**EIB**) have all played leadership roles in developing and shaping climate policy and in driving investments into climate mitigation and adaptation efforts. For example, the World Bank has, over many years, developed a suite of climate funds to invest in activities that reduce greenhouse gas emissions and have also worked with countries to develop policies around carbon pricing and the protection of national rainforest systems. The Inter-American Development Bank is funding efforts to implement NDCs and EIB has played a key role in financing climate investments.

[31] The idea behind the market mechanisms in Article 6 is to promote greater overall levels of ambition by giving all countries an incentive to go beyond the targets of their NDCs and monetize such "overachievement" by selling such over achievement to those countries struggling to achieve their own NDCs due to higher costs. The implications of the Article 6 negotiations also have profound implications for capital flows, resource allocation and overall fairness in the implementation of the Paris Agreement. Accordingly, the negotiations over the rules for implementing Article 6 have been challenging and fundamental issues remain to be resolved at the next COP in December 2020 in Glasgow. We expect additional investment (and additional ambition) once the Article 6 rules of the Paris Agreement are finalised.

[32] The features of the system established by Article 6.2 borrow significantly from the Kyoto Protocol CDM system, but with a critical distinction in that the mechanism applies to all Parties and is not merely a means for developing country Parties to transfer units to developed country Parties.

[33] Under the EU Emissions Trading Scheme liable entitles have to surrender Allowances to meet their compliance obligations or face a financial penalty on installations which did not comply with their obligations under the EU ETS. However, by also allowing the inclusion of cheaper offset credits (Certified Emission Reductions CERs) under the Clean Development as eligible to enable liable entitles under the EUETS to meet their compliance obligations this penalty provided a meaningful price signal, which in turn unleashed entrepreneurial innovation and finance flows towards lower carbon solutions. This is to be compared to Colombia whose carbon tax establishes a hybrid approach where there is a carbon price ceiling and emitters are incentivised to find lower cost solutions. The Colombian Carbon Tax Law came into force on January 1, 2017 and applies to the sales and imports of all liquid fossil fuels and industrial uses of natural gas, including all petroleum derivatives. The tax amount takes into consideration the CO2 emission factor established for each fuel (e.g., natural gas, kerosene and jet fuel, fuel oil, among others) for each energy unit (in terajoules) according to the volume or weight of the fuel. The tax is currently at US $5 (which is the equivalent of $15,000 Colombian pesos) per tCO2e, but this amount will increase annually until it reaches approximately US $11 per tCO2e.

In addition, there are also a number of institutions that have played a key role in the development of climate change policy and governance and the distribution of key data. Many of these are international organisations that are multidimensional and have only recently addressed climate change issues or have traditionally represented interests that have been averse to strong action on climate change. In more recent years, new organisations have been established specifically to deal with climate change. For example, the Organisation for Economic Co-operation and Development (**OECD**), the International Energy Agency (**IEA**), the International Renewable Energy Agency (**IRENA**) and the Global Green Growth Institute (**GGGI**). The latter is a treaty-based international, inter-governmental organisation dedicated to supporting and promoting strong, inclusive and sustainable economic growth in developing countries and emerging economies. All of these agencies have played a key role in providing data on the global economy and energy use, and materials and support to assist with policy development. In addition, the Global Commission on Adaptation which was launched in October 2018 focuses on the development of measures to manage the effects of climate change through technology, planning and investment.

In a business context, organisations such as the International Chamber of Commerce, which is the institutional representative of more than 45 million corporates in over 100 countries, has also played an important role, particularly given its official standing within the World Trade Organization, the United Nations or the G20. Other organisations such as the International Emissions Trading Association (**IETA**) are far smaller but represent those businesses active in the climate change sector and are highly influential in shaping global climate change policy.

Finally, also helping to shape the approach to climate change have been influential international non-governmental organisations who have a broader ambit, but for whom climate is a core focus of what they do. For example, The World Resources Institute, the Carbon Disclosure Project, the Coalition for Environmentally Responsible Economies, and more recently the Task Force on Climate Related Financial Disclosures (**TCFD**) have each made significant contributions toward mobilising climate action.

WORLD RESOURCES INSTITUTE (WRI)

WRI developed the GHG Protocol nearly 20 years ago, and it remains the foundation for GHG accounting at the corporate level while expanding its influence to cities and being adopted by governments into their own laws. Nine out of ten Fortune 500 corporates report their GHG emissions using the GHG Protocol. WRI also plays an important role across the landscape of climate action and international policy; actively participating in each conference of parties (**COP**), supporting work in various countries to implement NDCs and continuing to develop cutting-edge information-based tools, such as Global Forest Watch to assist in monitoring global deforestation and Aqueduct to assist in monitoring global water resources.

CARBON DISCLOSURE PROJECT (CDP)

CDP was also launched nearly 20 years ago and has grown into the world's largest reporting platform for corporates to disclose their level of GHG emissions, and their efforts to reduce them. CDP also covers physical climate risks to corporates and has expanded into water and deforestation disclosures. It has also expanded from corporates to include cities and states. When launched, it had the support of 35 investors with less than $1 trillion in assets and is now backed by over 525 investors with over $96 trillion in assets.

COALITION FOR ENVIRONMENTALLY RESPONSIBLE ECONOMIES (CERES)

CERES is celebrating 30 years as a business sustainability focused NGO. It made its mark focusing on financial investors' risk to climate by engaging shareholders and ranking corporates for preparedness to climate risk in various sectors. Today, its work involves operating specific networks focused on investors, corporates, and policies. It continues to advance aggressive action on climate through its networks and in 2017 launched its first foray into water with its Connect the Drops campaign, focused on the California water crisis.[34]

In addition, non-governmental organisations such as WWF, Conservation International, the Nature Conservancy, the Rainforest Alliance, and many local NGOs have also been very active in developing actions to mitigate emissions, in articulating the

[34] See Ceres Connect the Drops, https://www.ceres.org/initiatives/connect-the-drops

cause for better policy and in pursuing greater action on climate change. They often interact with other organisations such as the Rights and Resources Institute[35], a global Coalition of over 200 organisations dedicated to advancing the forestland and resource rights of Indigenous Peoples, local communities, and the women within them.

LESSONS FOR WATER

While the Paris Agreement is a landmark agreement, it has taken some 30 years to achieve this, and even now despite the global country commitments under NDCs, the gap between the reductions needed and the current emissions levels remains vast. Any thought that a similar regime could be established for water is simply not feasible both because of the time taken but also because of the nature of the resource. Water is a physical commodity critical to life, whereas greenhouse gas emissions are a pollutant which, if not removed, will harm life. Nonetheless, strong governance is critical to managing emissions and managing water.

Addressing climate change and managing global greenhouse emissions requires both a global and domestic policy response with all countries working together. No matter where they occur, greenhouse emissions accumulate globally and the overall impact on the earth does not fall within national boundaries. The actions of one country affects all others and without coordinated implementation of agreed international actions at the local level, greenhouse emission will not be managed. However, in the case of water, the issues around demand and supply and overall governance are based on the location of the resource, namely the water basin level. The successful long-term management of water requires a whole-of-basin approach with all stakeholders working together. Going forward, there is a real need for all stakeholders putting aside vested interests so that they may all work together to rapidly close the gap.

As is discussed further below in this report, a key next step is creating a common approach to assessment and disclosure of water risk. However, like the TCFD framework for climate-related financial risks, this is a starting point rather than the end point. There is a further role for the climate community to play in identifying the actions that business in particular can take to lead to greater basin resilience and assist companies in developing a mature understanding of the ways that they are interconnected with water throughout their operations and value chain. Developing a whole-of-basin approach hinges on the question of how water is valued. WWF's report on valuing water outlines the interconnectivity between basin-related risks and company-related risks and how water drives value, beyond it being only a resource input or a potential liability.[36] A basin-based approach must be supported by a more holistic view of water and its close interrelationship with company assets and liabilities.

Finally, as part of the governance approach, carefully designed incentive structures are also needed to facilitate greater uptake and implementation of a whole-of-basin management approach which may include real valuing and pricing of water, adopting water trading or water efficiency schemes and applying the principles of IWRM using basin-based boundaries rather than national ones. While water is sold as a commodity, in regions where there is water scarcity, or a need to carefully manage water, the adoption of market-based mechanisms may help provide stronger water governance within suitable basin areas.

[35] https://rightsandresources.org/

[36] "The Value of Water : a framework for understanding water valuation, risk and stewardship", WWF International, https://d2ouvy59p0dg6k.cloudfront.net/downloads/the_value_of_water_discussion_draft_final_august_2015.pdf

OUR RECOMMENDATION

Adopting a whole-of-basin management approach

CREATE A SET OF BEST PRACTICE GUIDELINES AND PRECEDENTS THAT INCENTIVISE, ENCOURAGE AND SUPPORT THE ESTABLISHMENT OF BASIN-BASED GOVERNANCE AND MANAGEMENT SYSTEMS, PARTICULARLY FOCUSING ON FACILITATING GREATER TRANSBOUNDARY COLLABORATION BETWEEN STAKEHOLDERS IN AT-RISK BASINS AND THE POTENTIAL ROLE OF MARKET MECHANISMS IN DOING SO.

THESE GUIDELINES AND PRECEDENTS SHOULD INCLUDE:

- undertaking a deep-dive review of existing Transboundary Agreements and River Basin Management Organisations (BMOs) to assess their implementation, governance, composition, authority and efficacy;
- developing guidelines on establishment, composition and authority of new River Basin Management Organisations (and recommendations for improvements to existing BMOs);
- applying governance standards including mechanisms that support monitoring and enforcement and that minimise opportunities for corruption;
- setting guidelines as to the management of stakeholders, transparency of allocations and setting of baselines in a way that takes into account future climate adjusted flows;
- establishing basin-wide water budget and setting appropriate allocations and targets to ensure the relevant basin remains in balance;
- creating a set of principles that articulates a hierarchy of water use that provides governing principles for basin management;
- accelerating and expanding the adoption of Transboundary Management Plans;
- protecting people and organisations at the base of the pyramid; and
- consideration of appropriate incentive-based structures, drawing upon those adopted in the climate change regime and in some existing water basins. This may involve a basin-wide water trading scheme that allows market-based pricing systems to incentivise and encourage water efficiency within the catchment. Any such trading scheme should:
  - work with corporates, non-profits, national and sub-national governments and communities to incentivise and encourage water efficiency within the catchment;
  - create a clear set of ownership principles and guidelines as to the allocation of rights to water based on the best available science and consideration in a broader climate context;
  - create a basin-wide water budget and allocation (similar to carbon budgets) that takes into account (a) basin-wide-needs assessment and science-based flow model adjusted for forecast changing weather patterns; and (b) the multiple competing needs of different users (including farmers, irrigators, towns, communities, and those less able to pay for the water);
  - apply the Valuing Water Principles;
  - create a mechanism for accountability and enforceability of the principles to ensure the overall integrity of the system;
  - take into account both the availability and quality of water in order to incentivise investment into technology and infrastructure that maximises opportunities for recycling and reuse of water (for example via an industrial water efficiency trading scheme);
  - explore the possibility (like carbon pricing), to advance a range of water pricing in different BMOs to develop a menu of working best practices for water pricing; and
  - explore the valuation and integration of storage into basin-management plans as a method of helping to stabilise the system.

NORDAUSTLANDET, NORWAY

Coastline of Nordaustlandet, the second-largest island in Norway's Svalbard archipelago. Most of the island is covered by massive white ice caps. The exposed rocky coast appears in reddish brown, peppered with blue and black lakes and flecks of white.

Source: Photo by USGS on Unsplash

5. Corporate climate action, climate risk & disclosure

As discussed in Chapter One, 70% of water use around the world is within agriculture (crops used for energy, food, textiles), 20% in manufacturing, and 10% used for domestic consumption. Whilst mobilising individual household change and initiating positive policy and investor responses are integral to solving our water crisis, one of the most important actors in the sector is companies.

Traditionally slow to take substantive action and often beset by a multitude of different requests from a variety of causes, boards of directors have pushed water down the list of priorities. This is in part a response to not fully understanding the impact of the water crisis on their organisations, inability to readily access the right type of information, and lack of awareness of the specific action that needs to be taken (also due in part to fragmentation within the water community of the requests).

In order to solve the water crisis, steps need to be taken to better engage the corporate sector, ensuring better prioritisation, information flow and action. To succeed, the water sector needs to draw upon the lessons from climate change

Corporate recognition of the climate crisis and responsive action

There is a rapidly growing acceptance amongst the corporate community that we are facing a climate crisis. In February 2020, JP Morgan, the world's largest financier of fossil fuels, warned clients that the climate crisis threatens the survival of humanity and that the planet is on an unsustainable trajectory. The JP Morgan report[37] on the economic risks of human-caused global heating, recommended

[37] https://extinctionrebellion.uk/wp-content/uploads/2020/02/JPM_Risky_business__the_climate_and_the_macroeconomy_2020-01-14_3230707.pdf.pdf

climate policy change or the world would face irreversible consequences. According to the research by JP Morgan economists David Mackie and Jessica Murray, the climate crisis will impact the world economy, human health, water stress, migration, and the survival of other species on Earth. It also implicitly condemns the US bank's own investment strategy and highlights growing concerns among major Wall Street institutions regarding the financial and reputational risks of continued funding of carbon-intensive industries such as oil and gas. Interestingly JP Morgan historically provided $75bn (£61bn) in financial services to corporates - most aggressively expanding in sectors such as fracking and Arctic oil and gas exploration since the Paris Agreement, according to analysis compiled for the Guardian last year.[38]

The report by the JP Morgan economists is reflective of a growing willingness to actively engage in working towards being net zero by 2050 (or earlier). Much of this action is now at levels ahead of policymakers and governments. For example, BP has announced that it will aim to become a net zero corporate by 2050 or sooner by tackling "all the carbon we get out of the ground as well as all the greenhouse gases we emit from our operations". The CEO of Blackrock, the world's largest fund manager with more than US$7 trillion of funds under management, stated in January of this year that his firm would begin divesting away from carbon-intensive assets in the actively managed part of the business. Finally, Microsoft CEO, Satya Nadella, announced in January that Microsoft would be carbon negative by 2030, will offset 100 percent of the corporate's historical emissions, and will launch a US$1 billion climate innovation fund.

LESSONS FOR WATER

For many corporates, water is critical to their business and value chains – and yet real, meaningful action has been slow to materialise. There are signs that this is changing – over 150 corporates around the world have signed the CEO Water Mandate, and others report their water exposure through CDP's reporting process. These types of public commitments to action are important, but lack the deep, systemic transformation that is required to tackle the volume of change required – particularly in agriculture where water footprints are extremely large, water risks are high, and the amount of action being taken by corporates to transform their supply chains and mitigate their risk is low.

Increasingly, investor based organisations like CERES are looking at the water risk of investment opportunities, but until there is a type of systemic understanding, and the type of public commitments from industry leaders that we have seen in climate change, the type of true action that is needed to solve our water crisis will be slow to come.

The emerging acceptance of climate responsibility and risk

Emerging out of the broader stakeholder governance around climate change, there are some critical new initiatives that are driving action on climate at a faster rate than policy. Action is being led by, among others, central banks and financial regulators, shifting in part the focus of climate change action to a capital markets activation challenge.

Initially, the voluntary programs run via CDP saw corporates report on and disclose their GHG emissions, to enable shareholders and others to evaluate the approach corporates were taking to managing their GHG emissions and to assess the corresponding risks to investors. Over time as this risk become more accepted and recognised as material, the approach to disclosure and then risk assessment gained a higher degree of formality. Initially, corporates pushed back on the need to disclose but increasingly it has become recognised as standard practice.

In 2015, then FSB[39] Chairman and Governor of the Bank of England Mark Carney declared climate change was the biggest risk to the global finance sector. This was a game changer and led the FSB to launch the Task Force on Climate-Related Financial Disclosures (**TCFD**) to develop voluntary, consistent climate-related financial risk disclosures for use

[38] https://www.theguardian.com/environment/2020/feb/21/jp-morgan-economists-warn-climate-crisis-threat-human-race

[39] In 2009, the Financial Stability Board (FSB) was created in response to the global financial crisis of 2008-2009, when the G20 discovered there was a bigger looming source of systemic risk to global capital markets than the subprime market

by corporates, banks, and investors in providing information to stakeholders. The Task Force considers the physical liability and transition risks associated with climate change and what constitutes effective financial disclosures across industries. By establishing the common framework for disclosure of climate risks with the goal of voluntary adoption amongst the major businesses and financial sector parties, TCFD set out to enable comparable and "decision-useful" information to lenders, insurers, and investors.

In 2017, the TCFD began issuing recommendations to corporates to aid them in their disclosures of pertinent information related to climate-related financial risks – releasing three documents in June of 2017 which outline future work regarding the Task Force's recommendations. The goal of these reports and recommendations was to provide corporates a structure and impetus for disclosing this information to better inform financial markets and investors. TCFD recommendations suggest that corporates disclose governance surrounding climate-based risks and opportunities, strategies for addressing such factors, risk management considerations and metrics and targets which can be used to assess those factors. In turn, investors, lenders, insurers and other participants in the market will have a more complete picture when assessing the value of those corporates and the risks they face and therefore encourage sustainable investments so as to build an economy which is resilient in the face of climate-related uncertainties. While these recommendations are voluntary and serve as guidelines to assist businesses in identifying and sharing both climate risks and opportunities, a number of countries have now incorporated the TCFD approach into domestic law.[40]

Significantly, the TCFD process has led to the recognition of two categories of climate risks which are material and systemically important to the proper functioning of global capital markets.

PHYSICAL CLIMATE RISKS

An example of this category of risk is where the frequency and intensity of extreme weather events lead to major damages and devaluations of assets. Events such as hurricanes, tornadoes, and large fires destroy assets, lower economic growth and can lead to entire classes of assets becoming uninsurable. The recent bushfires in Australia and California manifest profound evidence of increasing physical climate risks with the ability to quickly destroy billions of dollars in assets and economic output. Pacific Gas and Electric, a major energy provider, recently filed for bankruptcy as a result of their role in causing a major fire in California which climate change contributed to being bigger and significantly more destructive.

TRANSITION RISKS

The other category of climate risks currently not identified nor priced by capital markets are transition risks. These are substantially larger than physical risks and, as a result, impact a much broader and more valuable set of corporates and assets. Transition risks flow from changes in regulations and the market which can lead to substantial devaluations of carbon-intensive assets and even stranded assets. There is now a growing list of corporates operating in the energy coal value chain which are filing for bankruptcy as the result of lowering demand for coal to produce electricity. The energy and transport sectors are rapidly decarbonising due to the lower costs of less carbon-intensive options and this is leading to substantial reductions in the asset values of more carbon-intensive corporates.

The potential impact of physical and transition climate risks on corporates operating across the financial value chain including, for example, commercial banks, fund managers, insurance companies, and pension funds is both material and existential. Commercial banks hold debt in the order of trillions of dollars by corporates which were not evaluated for these risks when the loans were approved. As a result, the Bank of England just announced it will begin to stress test banks and insurance corporates against their exposure to physical and transition climate risks. It is expected other central banks, including the Reserve Bank of Australia, will soon conduct similar tests.

The move by central banks to begin the process of identifying, quantifying, and pricing physical and transition climate risks has led to similar efforts by their financial regulator colleagues. In Australia, both the Australian Securities and Investments Commission (**ASIC**) and the Australian Prudential Regulation Authority (**APRA**) have made statements about the material levels of climate risks facing corporates listed on the Australian Stock Exchange (**ASX**) and there is now universal acceptance that directors have an obligation to consider climate risk in decision-making.

[40] https://www.fsb-tcfd.org/

In mid-January 2020, the Bank for International Settlements released a landmark report on the enormous climate-related risks now facing capital markets. With the provocative title of "the green swan", the report highlights the challenges now facing central banks as they attempt to lower climate risks without triggering a rapid collapse in the value of high-carbon fossil fuel assets. The report went on to suggest that central banks may need to intervene in the worst case and acquire distressed and stranded high carbon assets, such as coal mines and coal-fired power plants.

Therefore, responding to the global climate crisis and substantially reducing carbon emissions by 2030 and 2050 is rapidly becoming a capital markets activation challenge. In 2018, total global investments into decarbonising assets and activities were approximately US$400 billion and in that same year investments into high carbon-emitting assets and activities were US$1.6 trillion. When we combine the declining costs of lower carbon stationary energy and transport options with the need to stimulate higher levels of economic growth not tied to asset bubbles driven by artificially low global interest rates, it becomes clear the only pathway to higher levels of sustainable prosperity for the entire international community is the complete decarbonisation of the global economy, along with prioritising the financing of natural capital asset protection. The investment into decarbonisation is substantial by all historical benchmarks yet the potential returns are also unprecedented.

Finally, it is worth noting that there is now also a working group looking at developing a nature-based equivalent to the TCFD via a "TNFD" or Task Force on Nature-related Financial Disclosures. The goal of this project is to support and enhance resilience in the global economy by redirecting flows of finance at scale towards nature-positive activities to allow nature and people to flourish.

LESSONS FOR WATER

While risks associated with water scarcity and water quality are gaining increasing attention and have been identified by the World Economic Forum as a critical global risk, they have not received the attention that climate change risks have and are now receiving under TCFD and the broader financial community. Numerous reporting and disclosure requirements do exist on water – from those specific to the sector (e.g. the Water Disclosure Project; GRI 303: Water and Effluents 2018) to others in which water is embedded in the other metrics being reported (e.g. Sustainable Apparel Coalition).

However, water has not reached the same level of attention as climate has with TCFD, and many corporates have not embraced such voluntary regimes. As a result, participation and information flows are ad hoc. In addition, these schemes often adopt reporting in multiple formats which reduces the effectiveness of the collected data as a water management tool.

Unlike climate change data, there is no common mechanism or reporting format through which to collect and share water data. In relation to assessment of water risk, companies reviewing their own value chains do not have a central platform they can access to obtain data about the risks within their value chains. This is challenged further by the fact that assessment of risk requires an understanding of basin conditions, which are localised. Although companies often understand the materiality of water for their business at a high level, many fail to overcome the first hurdle of accessing data within relevant basins. This creates uncertainty about both the science and level of information available on water resources and limits the ability to understand water scarcity risk.

On the disclosure side, company disclosure of water risk varies depending on the platform being utilised or depending on their investors and the metrics that are relevant to those investors – some investors requesting aggregate risk exposure, others requesting site-level data. This means that water risk and management disclosure is not consistent or comparable. It also often fails to illustrate a systemic story, as disclosure is piecemeal. As a result of the lack of a uniform mechanism or format for disclosure, capital markets are exposed to unpriced water scarcity risks which are not quantified.

Somalian refugees fetch water at the new Ifo-extension in Dadaab Refugee Camp, Kenya.

With this in mind, one option is to ensure water-related financial disclosures are included in the conversations around the emerging TNFD. Another option is to develop a new TWFD – a Task Force on water-related Financial Disclosures. This could avoid the complexity of attempting to include water within a broader nature discussion where water often gets sidelined or rolled into considerations like "biodiversity" instead of being recognised in its broader context. Like the TCFD has done for climate, this would create a focus on water-specific issues which relate across the breadth of value chains, and create specific disclosure guidelines for how corporates report on specific water risks and their corresponding risk-management strategies.

This will enable stress testing, the extent to which corporates are exposed to water scarcity risks and their strategies for managing them as well as test the exposure of both water-intensive corporates as well as the fund managers holding their debt and equity. While it is also possible to embed water in the risk assessment for climate risk under the TCFD (so as to not create a new disclosure body), simply incorporating water into the TCFD may risk losing water within a broader climate assessment. An additional benefit of leveraging a platform like the Financial Services Board's Taskforce on Climate-related Financial Disclosures is that it is a neutral third party platform. It is unclear currently who within the existing water community could play the role of leading risk assessment and management disclosure. Further, as has been done with TCFD, there is a role for regulators to play in advocating for companies to disclose, and investors to assess, water risk in a more coherent way.

Finally, as with carbon pricing, it is important that, like carbon, water is also valued and priced in terms of decision-making. In addressing some of the complex issues around water "pricing", the High-Level Political Forum in 2018 established the "Valuing Water Initiative" which recommends including a values-based assessment of water in all decisions. The values outlined in the Valuing Water Initiative are far broader than financial and include economic, societal and environmental. These values are designed to mitigate against the impact to consumers of a purely economic pricing scheme that sets a price on water without quantifying the other values attached to it.

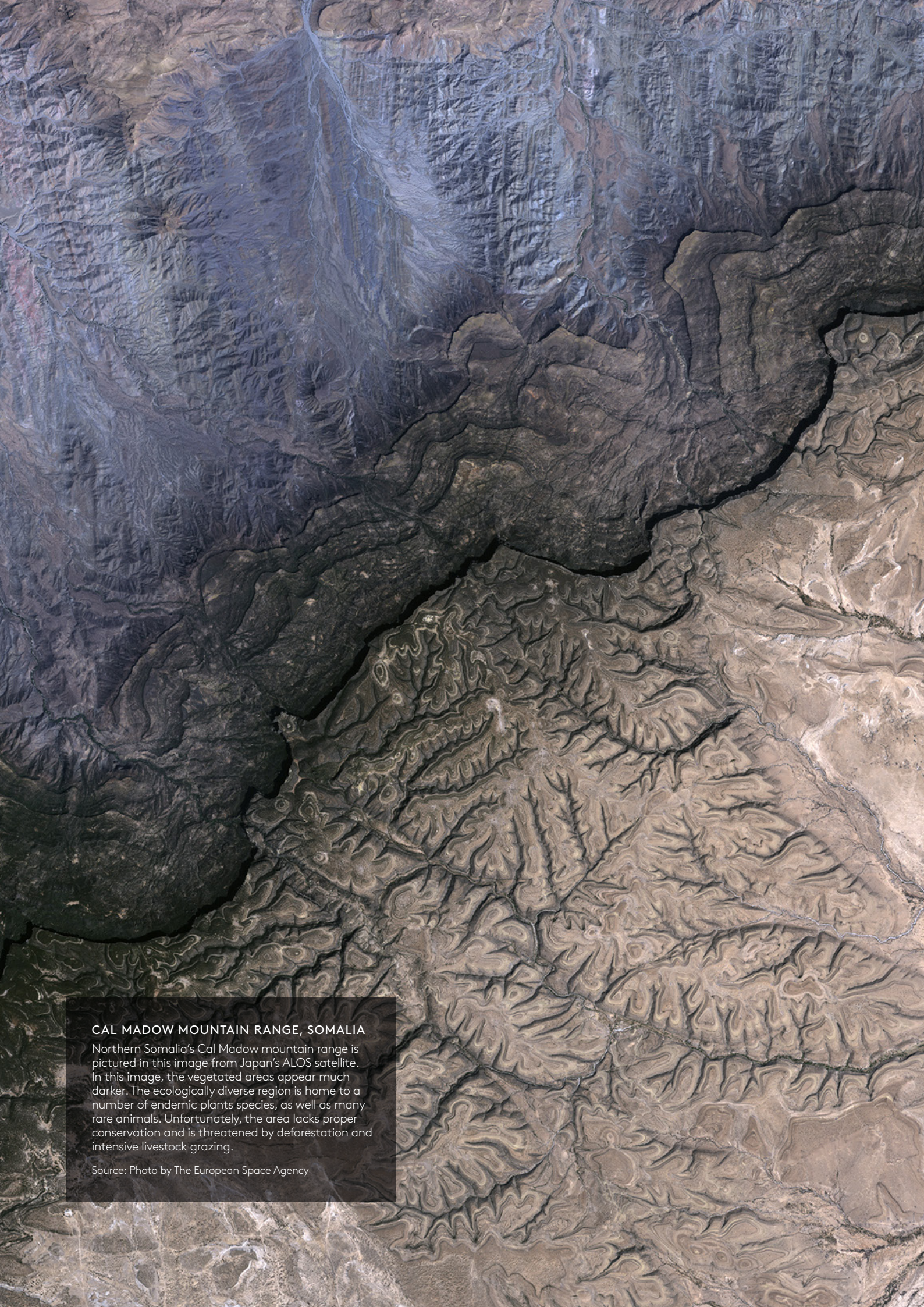
OUR RECOMMENDATION

Implementing, and disclosing, system-wide water risk assessment

AGREE ON A COMMON SET OF CRITERIA TO ASSESS, QUANTIFY AND COMPARE THE WATER RISK OF CORPORATIONS AND INVESTMENTS AND WORK WITH THE TCFD TO ENSURE THEIR DISCLOSURE.

THESE CRITERIA SHOULD:

- borrow from the climate change arena, and leverage the agreed science and improved data metrics, work with the finance and investment sectors to agree a set of criteria to assess and quantify water risk of investments, to "stress test" financial institutions' embedded water risk across their portfolios and to divest from heavy and inefficient water intensive investments in at-risk basins;
- enhance the TCFD to ensure a dedicated focus on water. This will enable stress testing the extent to which corporates are exposed to water scarcity risks and their strategies for managing them as well as test the exposure of both water intensive corporates as well as the fund managers holding their debt and equity. There is the option to replicate the TCFD and create the TWFD – the Task Force on Water-related Financial Disclosures – to create guidelines for how corporates report on these risks and their corresponding risk management strategies but it is more efficient to simply enhance the existing approach;
- accelerate the adoption of a system-wide approach in assessing project investment opportunities in order to take into account the potential benefits and risks associated with both climate and water aspects of significant investments;
- build a repository of successful projects that deliver both climate and water benefits to be used as a learning tool for replication and scaling; and
- work with government procurement agencies, multilateral development banks, and private financial institutions to ensure both climate and water impacts and benefits are considered in bid specifications and project finance criteria for large infrastructure projects.



CAL MADOW MOUNTAIN RANGE, SOMALIA

Northern Somalia's Cal Madow mountain range is pictured in this image from Japan's ALOS satellite. In this image, the vegetated areas appear much darker. The ecologically diverse region is home to a number of endemic plants species, as well as many rare animals. Unfortunately, the area lacks proper conservation and is threatened by deforestation and intensive livestock grazing.

Source: Photo by The European Space Agency

6. Adaptation

Water is integrally linked to climate change. Shifts in rainfall patterns, including the consequences of more extreme weather events such as droughts and floods, pose significant risks both for communities and nature as water towers shrink and aquifers fail to be adequately replenished. Failure to adapt to these changes in the nature and volume of water resources available has the capacity to significantly impact upon people, communities, economies, and supply chains as well as the natural environment. Indeed, evidence in places like the Murray Darling where historic flows were used as the basis for setting future targets indicate amongst others, the type of civil unrest that can occur when the need to adapt to the impact of climate change is ignored.

Adapting to climate change

Reducing greenhouse emissions (mitigation) must occur at scale if the Paris Agreement targets are to be met. However, we already know that a certain level of global temperature increase is locked in and that the impacts of climate change are already occurring. It is therefore critical that any management of climate change also deals with measures that plan and provide for climate change and enable countries, communities, and economies to adapt to what will be the devastating and unavoidable impacts of climate change.

Central to this is accelerating adaptation in key systems that produce food, protect and manage water and the natural environment, plan and build our cities and infrastructure, protect people from disasters, and provide financing for a more resilient future. The Global Commission on Adaptation Report, "Adapt Now: A Global Call for Leadership on Climate Resilience"[41] sets out how the climate crisis is disrupting these systems and offers specific, actionable recommendations for how to respond. In summary this includes:

- in the case of food, sharp increases in agricultural R&D; better alignment of government finance and incentives for farmers with long-term, sustainable, climate-smart production; and a step change in access to information; and innovative technologies;
- the large-scale protection and restoration of nature; appropriately valuing natural assets in land use and investment decisions; and increasing the scale of public and private resources to safeguard nature;
- scaled-up investments in healthy watersheds and water infrastructure, dramatic improvements in efficiency of water use, and the integration of new climate risks, such as floods and droughts, at every level of planning and operation; and more efficient water allocation and use;
- plan and deliver more resilient urban services, with cities investing in better climate risk information and technical capacity, drawing on credible topographic and community-level data; and investment in nature-based solutions to tackle water and heat risks and upgrading the viability of communities;

[41] https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf

- in a whole-of-system manner, climate-proof existing infrastructure and building new infrastructure so that investments in infrastructure directly build in resilience. This will require blended public finance; and

- in the face of more common extreme weather events and climate-related disasters, we need to prevent, protect, and recover. This means better planning and investment decisions; forecast-based planning; and scaling up disaster warnings and recovery efforts.

The Paris Agreement establishes an Adaptation Committee to oversee adaptation efforts. It requires countries to enhance their "adaptive capacity" through the carrying out of national adaptation planning processes, which include assessing climate change vulnerabilities and impacts to inform prioritisation of actions; implementing actions to adapt and build resilience; and monitoring, evaluating, and learning from adaptation plans, policies, programs, and actions. By including adaptation efforts in their yearly global stocktaking process, each country is required to submit and periodically update an adaptation communication, which summarises adaptation priorities, efforts, and support needs. This includes financial support. Many countries have already set out adaptation priorities in their NDCs and many governments have developed detailed adaptation plans.

In addition, as noted in Chapter 4 above, the Global Commission on Adaptation was launched in The Hague on 16 October 2018 by 8th UN Secretary General Ban Ki-moon. The Commission's mandate is to encourage the development of measures to manage the effects of climate change through technology, planning and investment. The Commission notes that adaptation actions bring multiple benefits called the triple dividend. The first dividend is avoided losses, that is, the ability of the investment to reduce future losses. The second is positive economic benefits through reducing risk, increasing productivity, and driving innovation through the need for adaptation; the third is social and environmental benefits. While avoiding losses is the most common motivation for investing in resilience, taken alone such losses underestimate the total benefits to society. Many adaptation actions generate significant additional economic, social, and environmental benefits, which accrue on an ongoing basis starting at the time of investment and are not dependent on the future state of the climate. In other words, they are both more certain and more immediate. Better awareness of, and evidence for, all three dividends will make the economic imperative case for adaptation ever stronger.

Despite the recognition of the need to adapt to climate change, investment in adaptation solutions has been limited – they are often seen as a cost (e.g. building sea walls) and not an investment that provides traditional financial return. This is despite the fact it is widely recognised that the costs of inaction far outweigh action and carefully planned adaptation investments will avoid significant future costs. For example, the World Bank estimates that the incremental cost of adapting to a 2°C warmer world by 2050 is in the range of $75 billion to $100 billion a year.

Adaptation must therefore be seen as critical to building long-term insurable, resilient economies and safeguarding communities. Where that requires public expenditure, it may be justified as critical public infrastructure paid for through public funds or financed through bespoke tax measures or financial instruments like bonds. In terms of future development and future infrastructure investment it is necessary for governments to ensure that policies and build requirements incorporate measures that make such infrastructure (including housing) more climate resilient and capable of withstanding climate events like bushfires and hurricanes. Finally, where disasters do happen, governments should have a comprehensive policy of how they will "build back better", so that replacing damaged and destroyed infrastructure is undertaken in such a way that if the event reoccurs, it is replaced so as to avoid the same damage reoccurring. For example, Fiji is now building its electricity transmission lines underground so they cannot be destroyed in a cyclone.

LESSONS FOR WATER

As noted above, climate change is integrally connected to water systems and resources. Climate change itself and deforestation will directly lead to droughts, floods, and disputation to rainfall systems. Successful adaptation will require ensuring that economic and public decision-making, public policy development and public planning and investment decisions take into account the implications for water. These decisions should avoid incentivising activities like water-intensive large infrastructure projects that are neither water nor climate smart. More efficient water allocation and use will be vital to economic growth and countries that make water management a top national priority, backed up by major governance changes and investments, are more likely to adapt and prosper; those that do not will experience serious challenges.

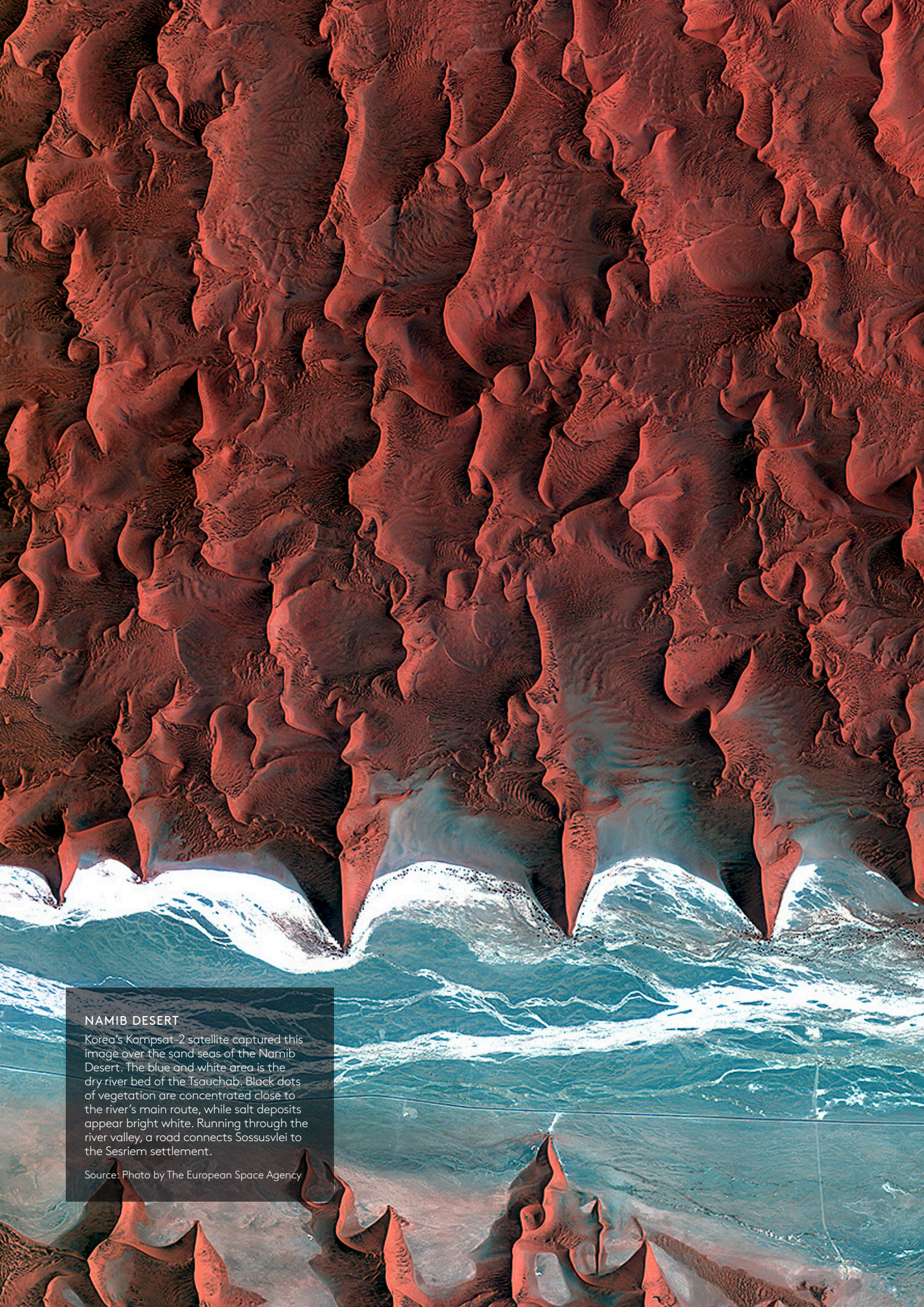
OUR RECOMMENDATION

Integrating adaptation into all government procurement, decision-making, planning and investments

ENSURE ALL ECONOMIC AND PUBLIC DECISION-MAKING, PUBLIC POLICY DEVELOPMENT AND PUBLIC PLANNING AND INVESTMENT DECISIONS TAKE INTO ACCOUNT THE IMPLICATIONS FOR WATER.

AMONGST OTHERS, THESE DECISIONS SHOULD:

- avoid incentivising activities like water-intensive large infrastructure projects that are neither water nor climate smart;
- ensure plans such as trading schemes or basin management plans are adjusted to account both for historical water flows, and for forecasts which take into account changing rainfall patterns and the impact of climate change;
- in the case of basins, particularly those relying on some of the most at-risk water sources (including mountain water towers), consider changes in the volume of water stored when planning for downstream water management – for cities, towns, communities, manufacturers and farmers;
- recognise water management as a top national priority, backed up by major governance changes and investments, acknowledging the importance of water-efficient allocation and use in economic growth;
- incorporate nature-based solutions including opportunities for ground water recharge (for example through porous or other nature-based surface covers); and
- account for continued upgrades to infrastructure including enhanced leak detection in recognition that averting breakages and leaks both minimises water loss and waste, and significantly reduces disruption to businesses and reduces the risk of lost revenue due to extended street and other closures.



NAMIB DESERT

Korea's Kompsat-2 satellite captured this image over the sand seas of the Namib Desert. The blue and white area is the dry river bed of the Tsauchab. Black dots of vegetation are concentrated close to the river's main route, while salt deposits appear bright white. Running through the river valley, a road connects Sossusvlei to the Sesriem settlement.

Source: Photo by The European Space Agency

7. Finance

The latest data show the cost of solving our water challenge is USD1 trillion per annum, representing varying percentage proportions of national GDP's from nil to 8%.[42] This includes (amongst others) investment in new infrastructure, efficiency mechanisms, and new technology.

Unlike climate change, dedicated finance at scale does not exist for water. Instead a raft of disincentives including low pricing, lack of water-directed multilateral funding opportunities and poor capital allocation incentives mean that water has traditionally been poorly financed. There is a significant gap between where the world is at now, and this USD1 trillion per annum target.

In the climate sector, increasing numbers of private, public and multilateral funds (e.g. the Global Environment Facility (**GEF**), Adaptation Fund, Green Climate Fund (**GCF**), and regional development banks) have helped finance activities that have both climate and water benefits. For example, water-related adaptation measures that have been pursued by developing countries. These provide one option to the water financing challenge – to include water as a central theme of climate finance, recognising the strong connection between climate change, infrastructure investment and water.

Financing the response

Action on water, like climate change, requires finance.

The United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement have always recognised that enhanced action by developing countries would require dedicated finance from developed countries. The term "climate finance" emerged, recognising that transnational, national or local financing – drawn from public, private and alternative sources of financing – is required to support mitigation and adaptation actions that will address climate change.

In 2009, at the UN summit in Copenhagen, developed countries agreed to provide $100 billion a year to developing countries to help them deal with climate change. The pledge aimed to reach this target by 2020, establishing the Green Climate

[42] World Resources Institute, "Achieving Abundance: Understanding the cost of a sustainable water future" https://www.wri.org/publication/achieving-abundance

Fund with an initial pledge of USD10.3 billion as a key mechanism through which to allocate such finance for transformative projects. Negotiations are now continuing under the Paris Agreement framework to increase this amount.

Putting these numbers into perspective, the IPCC estimates that an annual investment of $2.4 trillion is needed in the energy system alone until 2035 to limit temperature rise to below 1.5 °C from pre-industrial levels (equivalent of around 2.5% of the world's economy) while the Global Commission on Adaptation[43] estimates adaptation costs of USD180 billion annually from 2020 to 2030.[44] These figures do not include the cost of preventing deforestation and preserving rainforests though there is a strong need for financing of these activities to dramatically increase. Overall, agriculture, forest and land-related initiatives have struggled for funding.

A decade after the Copenhagen summit, it is still unclear whether the USD100 billion goal is close to being met, in large part due to disagreements over how to "count" funding allocations towards the target. Developing countries viewed such financial assistance as commitments to transfer a certain amount of public money (not to be conflated with loans and leveraged private funding or investments by developed country private investors in projects such as solar and wind projects) each year including, for example, funding results-based outcomes, whereas developed countries have included loans and private finance leveraged by public money. Despite this disagreement, annual tracked climate finance in 2017 and 2018 is estimated to have crossed the USD half-trillion mark for the first time[45], with annual flows rising to USD579 billion, on average, over the two-year period of 2017/2018.[49]

However the funding allocations are calculated and measured, it is clear that public funding allocations still fall short of what is needed under the 1.5˚C scenario. To fill some of the funding gap, the Green Climate Fund has supported a range of climate projects while the Multilateral Development Banks (**MDBs**) have also made large investments in climate-related activities.

The private sector has also increasingly been a part of the flow of funding into climate-related activities providing significant investment into energy, transport and REDD+ activities in developing countries, including through innovative financing mechanisms such as green bonds and sustainability-linked loans. Some of these financing mechanisms have been effective in attracting private investors who would not typically approach certain countries or impact investment funds due to perceived risks including volatility of political and macroeconomic environments and poor financial return. In these cases, those risks can be offset by concessional and blended finance that allow investments into climate change projects and infrastructure to be supported by concessional finance (such as that lowering interest rate) or a blend of concessional and traditional finance. For example, the Climate Finance Partnership (**CFP**), announced on 22 January 2020, aims to direct capital into climate-related projects in developing countries. The fund brings together BlackRock, the world leader in asset management, Agence Française de Développement (**AFD**), the German Ministry for the Environment and the Hewlett and Grantham foundations. The CFP plans to invest between USD500 million and USD1 billion in climate change mitigation projects in emerging countries. The funds will be invested in climate infrastructure in Southeast Asia, Latin America, and Africa. This includes the production of renewable energy, energy efficiency in residential, commercial, and industrial sectors, energy storage, and low-carbon transport services.

It is worth noting that significant investment continues to be made in activities that worsen the climate problem. For example, since 2010, USD20 billion has been provided to support the reduction of forest emissions and yet over the same the two-year period at least USD777 billion has been invested in land-use activities that could be driving deforestation and governments are heavily subsidising fossil fuel projects. In 2018, fossil-fuel subsidies totalled more than USD400 billion, according to the International Energy Agency, more than double those received by renewables.

[43] GCA 2019
[44] https://climatepolicyinitiative.org/wp-content/uploads/2019/11/2019-Global-Landscape-of-Climate-Finance.pdf
[45] Climate Policy Initiative, "Global Landscape of Climate Finance 2019" https://climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2019/

At a national level, countries such as Fiji (an environmental levy and a Green Bond) and Colombia (a carbon tax) have also undertaken their own domestic initiatives to raise domestic climate finance to support climate change investment.

LESSONS FOR WATER

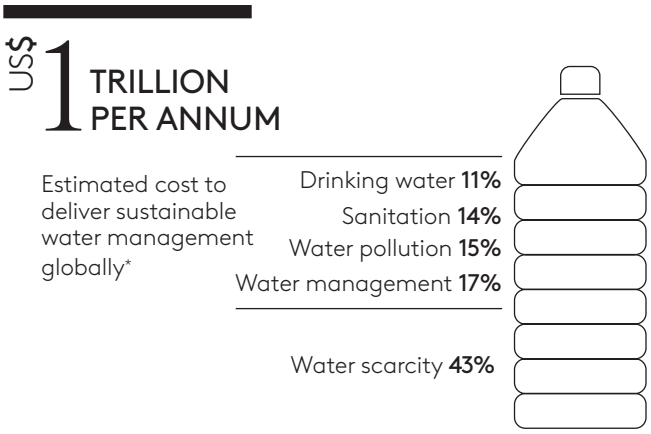
According to the WRI, the total estimated cost to deliver sustainable water management globally is USD1 trillion per annum. Of this, the largest portion (43%) is needed to address water scarcity, 17% to water management, 15% to water pollution, and the remaining 25% to drinking water (11%) and sanitation (14%). However, unlike climate change dedicated finance at scale does not exist for water.

Nonetheless, because of the strong connection between climate change, infrastructure investment and water, opportunities are available for leveraging climate finance to activities that have climate and water benefits. For many years, water-related adaptation measures have been pursued by developing countries both unilaterally and with the support of multilateral climate change funds (e.g. the Global Environment Facility (GEF), Adaptation Fund, Green Climate Fund (GCF)), regional development banks, bilateral donor assistance and the private sector.

Examples include:

- the GCF has approved project investments of over USD2.3 billion in 22 projects covering the categories of water security (e.g. efficient irrigation, desalination plants, water-management planning and water sharing); meteorological data collection and use; floodplain management, coastal protection, wastewater management; and hydro-electricity;
- as of May 2016, the GEF international waters program has funded, since its inception in 1991, a total of 242 projects with a portfolio amounting to a total of USD10 billion in combined GEF grants and co-financing from countries, donors, NGOs and the private sector, in 170 different GEF recipient countries[46];
- the Water Financing Facility is a nationally based pilot project by the Dutch Ministry of Foreign Affairs, in seven potential countries. USD1.23 billion per year in private finance may be mobilised by 2030 if national WFFs capture a 25% share of the investment needs. A pilot project in Kenya was established in early 2017 and has set a target to periodically issue bonds for water and sanitation projects, with the first to have be realised by the end of 2017;
- the financing mechanisms provided cover the full spectrum of finance from donor grants and loans; co-finance by governments; infrastructure investment - debt and equity investments in infrastructure; bonds; insurance mechanisms (e.g. against climate risks for irrigation harvest).

Although it is often difficult to attract private sector finance for adaptation projects, the water sector has had some success due to the importance of water as an input to agricultural and industrial processes and also the fact that in some countries water supply and treatment systems are operated either as state-owned enterprises or by the private sector. The Nairobi Work Programme's Private Sector Initiative captures information about a significant number of private sector investments in innovative measures developed to ensure water security, floodplain management, wastewater management and coastal protection in both developed and developing countries.



[46] GEF, "It's all about the water, transboundary water" (May 2016), https://www.thegef.org/news/it%E2%80%99s-all-about-water-transboundary-water.
* WRI "Achieving abundance: understanding the cost of a sustainable water future", 2020

Maranga Watershed project in Konso, Ethiopia.

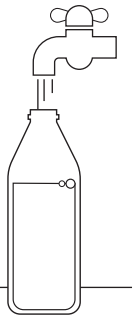
With the adoption of the Paris Agreement and the submissions of Nationally Determined Contributions (**NDCs**) the importance of water management has been underlined with 80% of NDCs containing water-related actions in their adaptation measures. The cost of implementing post-2020 water resource management activities in all of the 52 least developed countries, has been estimated to be more than USD93 billion per year.[47] This estimate highlights the current gap in available public finance instruments and financing needs in these countries.

There is wide scope to provide innovative and transformational climate finance in the water sectors of many developing countries and to leverage existing investments. This includes through direct project investments across infrastructure and data systems; support for watershed restoration projects; the raising of water bonds; the development of tradeable credit systems for water quality salinity, biodiversity; and support for water-management planning; to name a few.

By its nature, much water financing needs to overcome the traditional barriers for investment in nature-based projects, including illiquid or small-scale investment opportunities, smaller returns on investment and much longer time horizons. As is the case in respect of climate finance, there is a role for blended or concessional finance to play in de-risking these types of projects, particularly in sensitive regions. Financing may also be accelerated through the addition of water criteria to existing standards – for example, water is included in the EU Taxonomy and could also be added to other standards such as the Green Bond Standards. Spotlighting examples of bankable scalable water projects would demonstrate their success and the value they have generated for mainstream investors and could lead to higher replicability.

US$ **93** **BILLION/Yr**

The cost of implementing the **52 least developed countries** with post-2020 water management goals.



[47] SIWI, 'Water a success factor for implementing the Paris Agreement', Policy Brief, http://www.siwi.org/wp-content/uploads/2017/03/SIWI-Policy-Brief-Water-a-success-factor.pdf.

OUR RECOMMENDATION

Mobilising capital for water

DEVELOP NEW POOLS OF CAPITAL (SUCH AS A WATER EQUIVALENT OF OGCI OR IRENA), AN EXPANSION OF EXISTING CAPITAL (SUCH AS WATER WINDOWS WITHIN THE GCF OR GEF) OR LEVERAGE INNOVATIVE PRICING AND MARKET MECHANISMS TO MOBILISE ADDITIONAL FUNDING FOR WATER.

THESE COULD INCLUDE:

- **Water windows**
  Recognising the interlinkages between climate and water, formalising and expanding within the GCF and GEF the concept of "water windows" to include key identified sectors including sustainable agriculture, REDD, water-related infrastructure (noting a significant proportion of GHG's are emitted through the pumping of water that is wasted), and water-efficient food and energy production (noting the water – energy – climate nexus);

- **Water funding bodies**
  Creating an equivalent to IRENA or state-based development banks focused specifically on scaling and applying new water technology, in particular through smart tech including AI and other 4th Industrial Revolution type technologies. At a private sector level this could include creating an equivalent to the OGCI pool of capital that is focused specifically on scaling and applying new water technology; and

- **Price incentives**
  Leveraging market-based pricing mechanisms at a basin level as discussed in Chapter 3 to incentivise investment in otherwise financially unattractive but necessary projects including for example, fixing old and ageing infrastructure and promoting and encouraging recycling and reuse of water as a solution. In addition, as with desalination, exploring the payment for standby storage services.

OUR RECOMMENDATION

Accelerating investment in technology and infrastructure

ACCELERATE BOTH THE COMMERCIALISATION, SCALING AND APPLICATION OF EXISTING WATER TECHNOLOGIES AND THE DEVELOPMENT OF NEW TECHNOLOGIES INCLUDING THROUGH ALTERNATIVE FINANCING TOOLS SUCH AS BLUE BASIN BONDS, BETTER FOSTERING AND SCALING OF ENTREPRENEURIAL IDEAS, AND CONSOLIDATING, PRIORITISING, AND STREAMLINING PROJECT PIPELINES.

THESE COULD INCLUDE:

- **Consolidated project pipelines.** Working with River Basin Manaement organisations, nation states, scientists and the banking and finance sector to create a consolidated and prioritised pipeline ("Baskets") of water projects needed around the world. This includes new measures for water storage and transportation;
- **Alternative financing tools** Explore opportunities to create novel financial products that support the funding of those projects (for example, Blue Basin Bonds) and to encourage and incentivise building back better (or building new better);
- **Design guidelines** Consolidating existing "best in class" design principles for water-smart infrastructure and ensuring they are endorsed by financing entities, governments, and developers (e.g. a "LEED" for water infrastructure); and
- **Fostering entrepreneurial ideas** Create a Global Water Lab or concentrated window in CPI water labs (i.e. "Water tank").

BOMBETOKA BAY, MADAGASCAR

Here, the country's largest river flows into Bombetoka Bay, which then opens into the Mozambique Channel. The red colouring of the sandbars and islands between the "jellyfish tentacles" comes from sediments washed from hills and into the streams and rivers during heavy rain. The seaport city of Mahajanga can be seen in the upper-left corner of the image.

Source: Photo by The European Space Agency

8. Nature-based solutions

Nature-based solutions play a critical role in maintaining the health of freshwater ecosystems. Whether as a source of rainfall through the water vapour emitted in forest transpiration, a mechanism to clean water of contaminants through soil, rocks and trees, or a system to support retention of topsoil through complex root systems, forests, trees and other nature-based solutions are integral to the preservation of existing freshwater resources. Managing forests and other natural watershed assets can be complex – they are often located either across national boundaries, or elsewhere in a watershed requiring multiple sovereigns to agree on a collective approach.[48]

Forests and REDD+

As well as being integral to the global water cycle, the world's forests play a critical role in addressing climate change, acting as a natural carbon capture and storage technology, Forests are a natural carbon capture and storage technology. Through photosynthesis, forests use light energy to convert carbon dioxide (CO_2) and water to oxygen and carbon-based carbohydrates. Forests were the force behind the major "drawdown" of CO_2 in the atmosphere that occurred near the end of the Paleozoic Era, and today forests store the equivalent of 3,160 gigatonnes of CO_2, more than the amount emitted since the Industrial Revolution. When healthy, forests continue to absorb CO_2 from the atmosphere, but when damaged or degraded, they release this CO_2 back into the atmosphere, therefore increasing global emissions (deforestation accounts for approximately 11 to 15 percent of human-caused greenhouse gas emissions).

Forests also regulate global hydrological cycles, contain some of the world's most important biodiversity and ecosystems, provide livelihoods for local communities and the world's poorest people and support indigenous communities and cultures. Forests preserve local water quality and availability, maintain watersheds, and provide ecosystem services related to water regulation and erosion control. They absorb rainfall and snow melt and slow storm run-off (thereby reducing flooding), recharge aquifers, sustain stream flows and filter pollutants from the air and run-off before they enter the waterways.

[48] An example of a system which has been deployed include the Nature Conservancy's Water Funds in Latin America

In areas like the Amazon where mass deforestation has removed huge numbers of trees, scientists are concerned that this will impact both local and regional hydrological cycles as the Amazon's role in creating rain and the rainfall patterns upon which humanity depends becomes less predictable.

Recent studies have demonstrated that halting the destruction of tropical forests and allowing those forests to continue sequestering carbon and regrowing at current rates can provide at least 30 percent of all mitigation action needed to limit global warming to 2° Celsius, in line with the goals of the Paris Agreement. In fact, natural ecosystems provide one of the most cost-effective and immediately available solutions to rapidly mitigating climate change while also providing a host of co-benefits. Conserving ecosystems, avoiding deforestation and restoring high-carbon ecosystems like forests — known as natural climate solutions or nature-based solutions — provides a "biological bridge" to enhance the ability to quickly reduce greenhouse gas emissions while other technologies such as carbon capture and storage ramp up.

The avoidance of deforestation and degradation has been recognised as a key measure by which many countries will meet their obligations under the Paris Agreement. The Paris Agreement also extends avoidance and protection to other high-carbon ecosystems ("sinks"), including peatlands and mangroves, avoided deforestation that maintain and enhance standing forests, including restoration. Notably, it also specifies the "non-carbon benefits associated with such approaches [of sustainable management of forests]".

The provisions endorsing REDD+ (Reducing Emissions from Deforestation and Forest Degradation) that are set out in the Paris Agreement have been developed and implemented over the last decade.

Originally, activities to protect forests were undertaken on a voluntary project basis. Carbon that was sequestered was monetised in the form of carbon offsets (or REDD+ credits) issued under the verified carbon standard, with revenues being used to underwrite the project costs. Whilst nature-based solutions have driven the voluntary carbon markets to a five-year high[49], the level of investment remains orders of magnitude below what it needs to be to make a meaningful contribution to achieving net zero emissions by mid-century. Though voluntary initiatives are not a substitute for legal mandates, they have, and will continue to play, an important role in demonstrating concepts and allowing engagement by a diverse group of actors.

As REDD+ began to be financed by governments such as Norway, Germany and the UK, the historical project-based approach to REDD+ projects gave way to a national level one[50] in order to try to address concerns over leakage and governance at the project level.

This jurisdictional national-level approach however does not focus governance at the ecosystem level (e.g. the Amazon as a whole), but rather chooses national sovereigns as the governing bodies. Whilst this improves on concerns related to leakage at the project level, it fails to solve them as leakage can occur across national boundaries within the same forest ecosystem.

As well, no country has yet fully reconciled the existing project-level activities within their national REDD+ system. "Nesting" projects into a national-level program can be accomplished, but there are a number of policy decisions that need to be made by governments as part of this "nesting" process, including:

- the degree to which governments want to encourage continued private investment in REDD+ on the ground;
- resolving which entities own the rights to the emission reductions (as it cannot be assumed that the national government automatically owns the emission reductions);
- how to reconcile accounting at the project level and national level; and
- how to ensure continued and proper benefit sharing with indigenous peoples, forest communities and other stakeholders.

These issues have been solved for at the project level under the voluntary standards, but in most cases not at the national level.

[49] The most recent report from Forest Trends' Ecosystem Marketplace, launched in Madrid at COP25 in 2019, notes that nature-based solutions have driven the voluntary markets to a seven-year high, with approximately 98.4 million metric tonnes of carbon dioxide transacted with a market value of $295.7 million. See "Financing Emissions Reductions for the Future – State of the Voluntary Carbon Markets Report 2019, https://www.ecosystemmarketplace.com/carbon-markets/

[50] Measuring against a national forest reference baseline.

Finally, Article 5 of the Paris Agreement now introduces the concept of a results-based payment where countries are paid to maintain forests based on a per tonne of carbon sequestered. In these instances, there is no sale or transfer of REDD+ credits. The Green Climate Fund and the World Bank as Trustee for the Forest Carbon Partnership Facility have endorsed this approach and, as a result, the party protecting the forest is paid to do so, providing a direct financial value to the forest. This arrangement is also close to "Payments for Ecosystem Services" schemes which focus more on the non-carbon, biodiversity, and water-related benefits of nature.[51]

Slash-and-burn farming for palm oil production in Sumatra.

LESSONS FOR WATER

Given the critical relationship between forests and water, the preservation of forests through activities such as REDD+ is critical. Efforts should be made to ensure the connectivity to water is understood and prioritised. For example, in Kenya, the government has prioritised preservation of five cloud forest areas within Kenya that are commonly known as the five "water towers". This is being done as part of Kenya's response to climate change, as set forth in its NDC.

The carbon challenges faced in managing forestry assets at a national level are also relevant for water. The trade-off between establishing project-based forest ecosystem-level governance for REDD+ versus restricting it to national boundaries provides some lessons for water governance, as managing water at a basin level is the optimal means to address the water crisis, but will carry with it challenges of getting multiple sovereigns to agree on collective actions.

The opportunity also exists to use nature-based solutions to solve water problems including replanting watersheds, halting tropical deforestation (REDD+), promoting soil carbon-retention projects, and green infrastructure to promote recharge and filtration. At a global level, preserving and restoring the world's tropical forests is vital to maintaining rainfall which ultimately impacts the entire water cycle, down to the basin level. Also, given the increasing focus on funding measures to improve climate resiliency under the climate regime, there are opportunities for investing in nature-based solutions for water outcomes under the existing climate-financing mechanisms. However, this requires new approaches to valuing such actions, such as results-based payments or scaling up payment for ecosystem service programs (e.g. The Nature Conservancy's "Water Funds" in Latin America) which put a "price" on water by providing a mechanism for downstream users to pay upstream water "producers" for activities that improve water quality and/or water quantity. Upstream activities could include conserving threatened forests, reforestation, and protection of watersheds, for example through eco-friendly cattle ranching.

[51] See, The Nature Conservancy's "Water Funds" in Latin America [CITE]

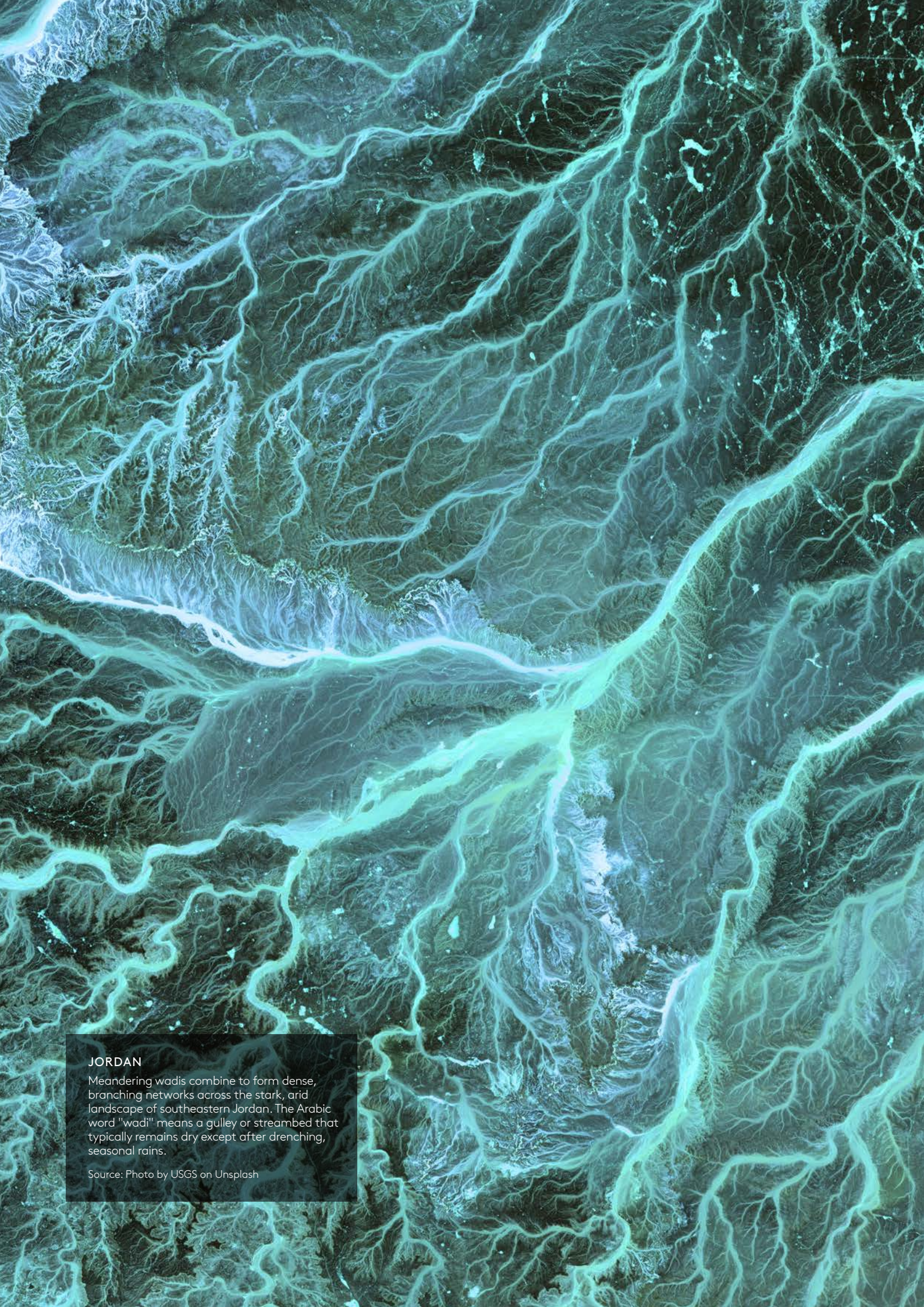
OUR RECOMMENDATION

Promoting nature-based solutions

PROMOTE THE INCREASED USE OF NATURE-BASED SOLUTIONS TO SOLVE WATER PROBLEMS, INCLUDING DEVELOPING INNOVATIVE FUNDING MECHANISMS TO ENHANCE AND ENCOURAGE INVESTMENT IN APPROPRIATE WATER-FOCUSED NATURE-BASED SOLUTIONS.

THESE CAN INCLUDE:

- Promote the increased use of nature-based solutions to solve water problems including replanting watersheds, halting tropical deforestation (**REDD+**), promoting soil carbon retention projects, and green infrastructure to promote recharge and filtration. At a global level, preserving and restoring the world's tropical forests is vital to maintaining rainfall which ultimately impacts the entire water cycle, down to the basin level. Also, given the increasing focus on funding measures to improve climate resiliency under the climate regime, there are opportunities to investing in nature-based solutions for water outcomes under the existing climate-financing mechanisms.
- Explore and develop opportunities to create new natural water infrastructure such as the Upper Lusatian Biosphere Reserve in Germany which has been created from disused coal mines.



JORDAN

Meandering wadis combine to form dense, branching networks across the stark, arid landscape of southeastern Jordan. The Arabic word "wadi" means a gulley or streambed that typically remains dry except after drenching, seasonal rains.

Source: Photo by USGS on Unsplash

9. Technology transfer

Increasing the scale and breadth of deployment of technology will be key to helping to solve our global water crisis in two ways:

1 **INNOVATING NEW SOLUTIONS TO EXISTING AND DEVELOPING WATER PROBLEMS.**

This can include development of technology solutions "from scratch" or the application of (for example) solutions of the 4th Industrial Revolution to the water sector. Examples of these types of innovation include water from air[52] and desalination[53]; and

2 **SCALING THE ADOPTION OF EXISTING TECHNOLOGY.**

across geographic, cultural and economic boundaries. For example, drip smart technology systems.

The greatest challenges in the water sector is the second – the scaling and deployment of technology solutions, for if new technology can gain widespread acceptance and adoption, the increased demand for it will also help drive further innovation.

Both of these approaches may also include opportunities to recycle and reuse existing water supplies. Technologies exist and are deployed in municipalities, companies, farms, and factories around the world to both reduce the generation and release of wastewater, and to treat and recover it.[54] However, without adequate price or other regulatory incentives, or without some form of physical constraint which necessitates greater water efficiency, there is little incentive for many of these technology interventions to be deployed at scale, an experience that was also initially the case with energy efficiency

Philippino residents filled their containers with deep well water when a service interruption lasted for days causing water shortage.

[52] Increasingly, technological solutions are being developed that use solar and wind energy sources to support the condensation of water from the atmosphere, almost "pulling" it from the surrounding air. Zero Mass Water is one of those – developing mass solar panels for deploying on the rooftops of homes in arid desert environments and which use the power of the solar cells to pull water from the atmosphere, condensing it for use in the house below.

[53] Traditional forms of desalination have been heavily energy intensive however increasingly solar thermal-based technology is being deployed to treat seawater. Seawater greenhouses have been set up in Jordan and Tunisia and most recently in South Australia. The challenge of desalination is the need to have a source of water.

[54] For drinking water, despite efforts by cities like Singapore and San Diego where recycling wastewater for drinking has been successfully implemented, the majority of communities where this has been floated have strenuously objected – even where those towns were located in areas suffering water shortages. In the case of water efficiency, increasingly industry and other standards are being developed and/or water is being incorporated into existing guidelines (for example in BCI Cotton, BonSucra sugar, or AWS standards)

Technology transfers

Under the UNFCCC, there are specific provisions that promote the sharing of technology designed to control, reduce, or prevent greenhouse gas emissions between developed and developing parties to the UNFCCC Convention. This includes renewable energy technologies such as wind energy, solar power and hydropower; climate technologies such as drought-resistant crops, early warning systems and sea walls; and "soft" climate technologies, such as energy-efficient practices or training for using equipment.

This commitment has since been further enhanced through the development of a technology transfer framework, a technology needs assessment and the establishment of the "Technology Mechanism" which analyses technology policy issues and provides recommendations to support countries in enhancing their climate technology efforts. It also has an implementation arm that has three core services: providing technical assistance at the request of developing countries; creating access to knowledge on climate technologies; and fostering collaboration among climate technology stakeholders.

In 2015, the Paris Agreement formally adopted the Technology Mechanism and strengthened its role requesting further work on technology research, development, and demonstration, as well as endogenous capacities and technologies. The Paris Agreement also established a technology framework to provide overarching guidance to the Technology Mechanism. Together, the Technology Mechanism and the technology framework will support countries to adopt new technology that will help limit the rise in global temperature and enable them to adapt to climate change.

For many developing countries, the idea of technology transfers was designed to see leading climate technologies and solutions transferred to, and implemented in, developing countries and funded by developed countries. However, given that many technologies are owned by the private sector and have clear intellectual property rights, such large-scale, wholesale, direct transfers were never likely to occur. Rather, technology that has transferred has been largely through donor-funded programs and under mechanisms such as the Clean Development Mechanism (**CDM**) which has enabled private sector to private sector technology transfer opportunities. In particular, those countries that have run large-scale auction processes to sell the rights to supply renewable energy, such as South Africa and Morocco, received large-scale investment and the deployment of the latest technology.

In addition, both the GEF and the GCF have provided financial support to developing countries to develop and deploy climate technologies. Since 1991, the GEF has supported developing countries to implement more than 800 projects with mitigation technology transfer objectives through over USD5 billion of funding and USD40 billion of co-financing. Since 2001, the GEF has also supported adaptation technology transfer through the least development countries fund and the special climate change fund. These two funds have provided more than USD1 billion for over 300 projects with adaptation technology transfer objectives. Since 2009, the GEF has supported climate technology activities under the Poznan strategic program.[55] Initially established with a budget of USD50 million, this programe aims to scale up the level of investment for technology transfer and thus help developing countries to address their needs for climate technologies.

LESSONS FOR WATER

The early deployment of climate technology through private sector transfer incentives effectively deputised hundreds of companies to act as advocates for the uptake of new systems, procedures, and technology. Whilst not without its issues, the system allowed key individuals in key corporations or communities to have access to new or different technologies. These in turn became "showcases" for others in their communities (or their competitors) and effectively helped to normalise them – in turn increasing demand, uptake, and deployment. There are some examples in the water sector largely led by non-profits such as WWF or TNC where this type of deployment of technology has occurred, but it is not comprehensive or scaled. In addition, the demand that large-scale deployment of climate technology has created has resulted in very large capital allocations made to further technology innovation. This provides a blueprint for the importance of creating scale and reach in the deployment of water-related technology.

[55] https://unfccc.int/ttclear/support/poznan-strategic-programme.html

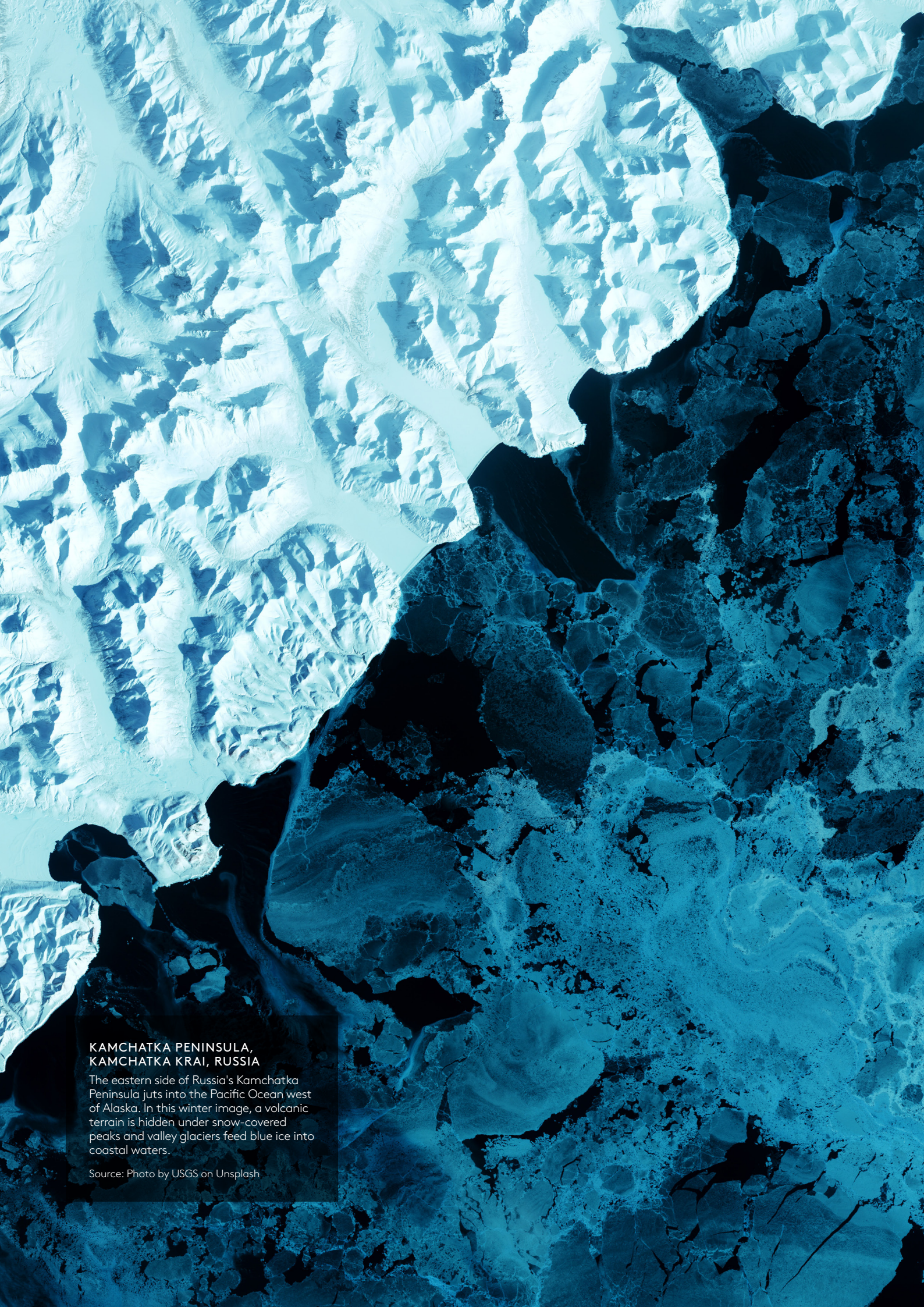
OUR RECOMMENDATION

Accelerating deployment of technology

EXPLORE OPPORTUNITIES TO CREATE MARKET-BASED MECHANISMS TO ACCELERATE THE TRANSFER OF KNOWLEDGE AND TECHNOLOGY WITHIN AND BETWEEN AT-RISK BASINS.

THESE SHOULD INCLUDE:

- recognising the power of technology to (amongst others) support greater water efficiency, monitor ground and surface water use, provide signals to change behaviour and to shift available water resources;
- identifying opportunities to apply technology from the 4th Industrial Revolution to water;
- using the price and other financing incentives discussed elsewhere in this report to pilot, scale and accelerate time to market of some of the more innovative technologies, particularly related to increasing water supply;
- bringing together technologies in sectors with heavy reliance on water to understand, scale and develop game-changing technology solutions (e.g. agriculture);
- understanding what type of incentives (if any) could be created to encourage and scale private sector support for accelerating technology transfer systems in the water sector; and
- exploring the possibility to access capital from the GEF and GCF to support the deployment of technology (see above reference to "windows" within these funds in Chapter 7).



KAMCHATKA PENINSULA, KAMCHATKA KRAI, RUSSIA

The eastern side of Russia's Kamchatka Peninsula juts into the Pacific Ocean west of Alaska. In this winter image, a volcanic terrain is hidden under snow-covered peaks and valley glaciers feed blue ice into coastal waters.

Source: Photo by USGS on Unsplash

10. Working in key sectors - energy & agriculture

Solving a major issue like climate or water requires a strategic approach – targeting the areas where the biggest impact can be created with greatest economic and resource efficiency.

Early in the evolution of climate change discussions, work was done to identify and articulate sectors where the greatest amount of emissions were occurring and calculate their relative cost of abatement. These "cost curves" formed the basis for the development of various strategies and emphasis of work – selecting "winners" or sector(s) where greatest reductions could occur at least cost. In the case of climate, that sector was energy, and the solution – a move towards renewables. Without the equivalent type of cost curve, work in water is missing the global strategic focus of action that energy has delivered to climate change.

Energy accounts for two-thirds of total greenhouse gas and efforts to reduce energy-related emissions are included in most NDCs in the form of targets or pathways to decarbonise energy systems, achieved largely through the increase of renewable energy into existing energy systems and the phase out over time of fossil fuel generated electricity. Some countries have also adopted carbon pricing programs to reduce emissions from the energy sector, which has led to greater investment in clean energy.

This shift to more renewable energy brings with it issues around the availability of the energy resources when wind and solar systems are not operating. This is being addressed through the integration of energy storage (through batteries and pump storage hydro for example) into the underlying energy system to ensure stability and supply. This also raises questions as to how such standby storage, which is a public good, is priced. Furthermore, generation facilities need to be located where the wind and solar resources, for example, exist, and then the energy generated transported to the demand. Nonetheless, as these issues are resolved it also opens up greater flexibility to establish more decentralised energy systems where towns are becoming more resilient and building their own energy grids.

By comparison, in the case of water, agriculture is to water, what energy is to climate. The single biggest user of water is and will remain agriculture. Across the world on average, 70% of water withdrawals are used for agriculture (compared with 20% for manufacturing and 10% for domestic household consumption).

The Paris Agreement does not make explicit mention of agriculture, given many developing countries are concerned that reducing greenhouse gas emissions from agriculture would compromise their ability to generate sufficient food for their nations. It does, however, recognise the "fundamental priority of safeguarding food security and ending of hunger" and "the particular vulnerabilities of food production systems to the adverse impacts of climate change". It also notes an overall goal of the Paris Agreement is to increase "the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production".

Nonetheless, Agriculture, Forestry and Other Land Use (**AFOLU**)[56] is responsible for just under a quarter (~10–12 Gt CO2eq/year) of global anthropogenic GHG emissions, mainly from deforestation and agricultural emissions from livestock, soil, and nutrient management. Emissions from agriculture include domestic livestock (enteric fermentation and manure management), rice cultivation (flooded rice fields), prescribed burning of savannas, field burning of agricultural residues and agricultural soils. Of these categories, enteric fermentation (methane) is the largest emitter globally, followed by manure on pasture, synthetic fertilisers, rice cultivation and manure management.[57] Of the 106 countries that include Land Use, Land Use Change and Forestry (**LULUCF**) as a covered sector in their NDC, 38 of those setting out express targets to manage emissions from LULUCF activities.

At the same time, emissions from the AFOLU sector can be reduced through an enhancement of removals of GHGs by natural sinks (including the reduction of emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks (**REDD+**)) and a reduction of emissions through management of land and livestock. If fully implemented, LULUCF mitigation actions outlined in current NDCs could contribute between 0.8 - 3.8GT CO_2-e per year. In particular, a range of land-based activities can significantly reduce global emissions, namely the protection of forest lands; the adoption of sustainable and regenerative agriculture (croplands, grasslands namely rangelands and pasture land); the prescribed burning of savannas, which includes annual planned burning, can reduce the emissions from fire in savannas though a reduction in the frequency and extent of late dry season fires; and the protection of wetlands and peatlands and coastal and marine ecosystems and the carbon stocks contained within them.

LESSONS FOR WATER

The focus of the climate change regime on delivering significant abatement results through a strategy that prioritises action in a single sector has been successful. Increasing numbers of investors and asset allocators are divesting from fossil fuels, and large numbers of governments and other entities are committing to renewable energy targets. This has resulted in significant decarbonisation of the energy sector across the world.

Without the equivalent of the cost curves that helped drive the insight on energy, the data from organisations like WRI provides insights into where the equivalent type of gains could be created – agriculture, specifically irrigated (as opposed to rainfed) agriculture, is one of the key sectors where we could achieve least-cost highest impact results in combating water scarcity.

There are dual benefits to a focus on agriculture. Firstly the impact on water, and secondly the impact on climate change: increasingly recognised by the international climate community as key to mitigating the impact of climate change through, for example, LULUCF and regenerative agriculture (operating as carbon sinks). Importantly, as noted earlier in this report, steps to improve the efficiency of irrigated agriculture will not address overallocation, unless there is also absolute reduction of water extracted from catchments. Further, the issue in agriculture is not only one of overallocation but also impacts on water quality, given it is a major polluter of water through fertiliser run-off, pesticide use and livestock waste. Focus on this sector can deliver significant gains in relation to sustainable water management and at the same time, provide visible confirmation to the community that positive results are possible.

[56] Agriculture, Forestry and Other Land Use (AFOLU is a term coined by the Intergovernmental Panel on Climate Change (IPCC) to describe a category of activities which contribute to anthropogenic greenhouse gas (GHG) emissions. The six land-use categories are forest land, cropland, grassland, wetlands, settlements and other land (2006 IPCC Guidelines). AFOLU combines two previously distinct sectors LULUCF (Land Use, Land Use Change and Forestry) and Agriculture.

[57] IPCC AR5 Ch 11.

OUR RECOMMENDATION

Targeting least-cost, high-impact sectors beginning with agriculture

FOCUS GLOBAL RESOURCES AND EFFORT FIRST ON ACHIEVING THE LEAST-COST, HIGH-IMPACT RESULTS IN A SPECIFIC SECTOR ("PICKING A WINNER"), IN THE CASE OF WATER – IN INCREASING EFFICIENCY IN AGRICULTURE.

THIS SHOULD INCLUDE WORK WITH WRI AND THE WORLDS' LARGEST AGRICULTURAL CORPORATES TO:

- understand where the greatest opportunities exist for least-cost, high-impact, scalable solutions to the world's agricultural water use;
- scope existing technological and behavioural solutions (including GMO and other seeds that may be, for example, resistant to drought or certain types of pest (reduces watering)) and what needs to be done to scale and deploy them;
- examine existing areas of unsustainable farming, cropping or other agricultural use of land and understand transformation or adaption options; and
- have a core focus on reducing water demand – growing and making more with less.

PERUVIAN LANDSCAPE

The foothills of the Andes Mountains near the southern coast of Peru were captured by the Kompsat-2 satellite. The Andes stretch about 7000 km from Venezuela down South America's west coast to the top of Argentina. Running across the centre of the image you see a patchwork of agricultural plots along what appears to be a source of water run-off from the mountains – although there looks to be little to no water present when this image was captured. This area is extremely dry, as evident in the sparse vegetation.

Source: Photo by The European Space Agency

11. Storage

As the transition to energy has shown, being able to generate and store supplies at a time of need is critical. In the case of water, generating water and managing storage has always been a complex issue with the traditional response to shortages often being to invest in mass new engineering projects - including dams.

These are extremely expensive and, given changing weather patterns and increasing rainfall variability, in many cases, a suboptimal way to deal with storage issues. Instead, economics and institutional reforms can play a critical role, either in creating greater efficiency in the use of stored water via implementation of trading schemes (like in the Murray Darling Basin), or via changing water storage policy and systems to allow maximal water retention and appropriate allocation of flows.

Historically strong and relatively reliable rainfall patterns, comparatively large storage (either naturally via snowpack and high groundwater levels or artificially via dams and other infrastructure) in relation to demand has traditionally meant that management of water storage systems could occur on an ad hoc basis – drawing down in times of shortage and accumulating when rain fell. However, as demand for water for energy, food, agriculture, and other uses has increased, so too has the need for better and more efficient ways of managing existing storage, and for enhancing and expanding both artificial and natural water storage systems. Failure to do so has seen catastrophic consequences with big cities like Chennai (India's 6th biggest city) running dry in 2019, and Cape Town coming close to running dry in 2018.

LESSONS FOR WATER

Lessons can be drawn from energy where decentralised, highly efficient infrastructure is increasingly being deployed to manage energy infrastructure challenges. In water, this could include the deployment of nature-based solutions to recharge river basins, recharging groundwater supplies through (for example) increasingly porous surfaces or decreasing reliance on groundwater withdrawals for (for example) agriculture. It may also include increasing management of surface water in times of flooding or surplus.

Indian residents fill water containers from a government water supply truck.

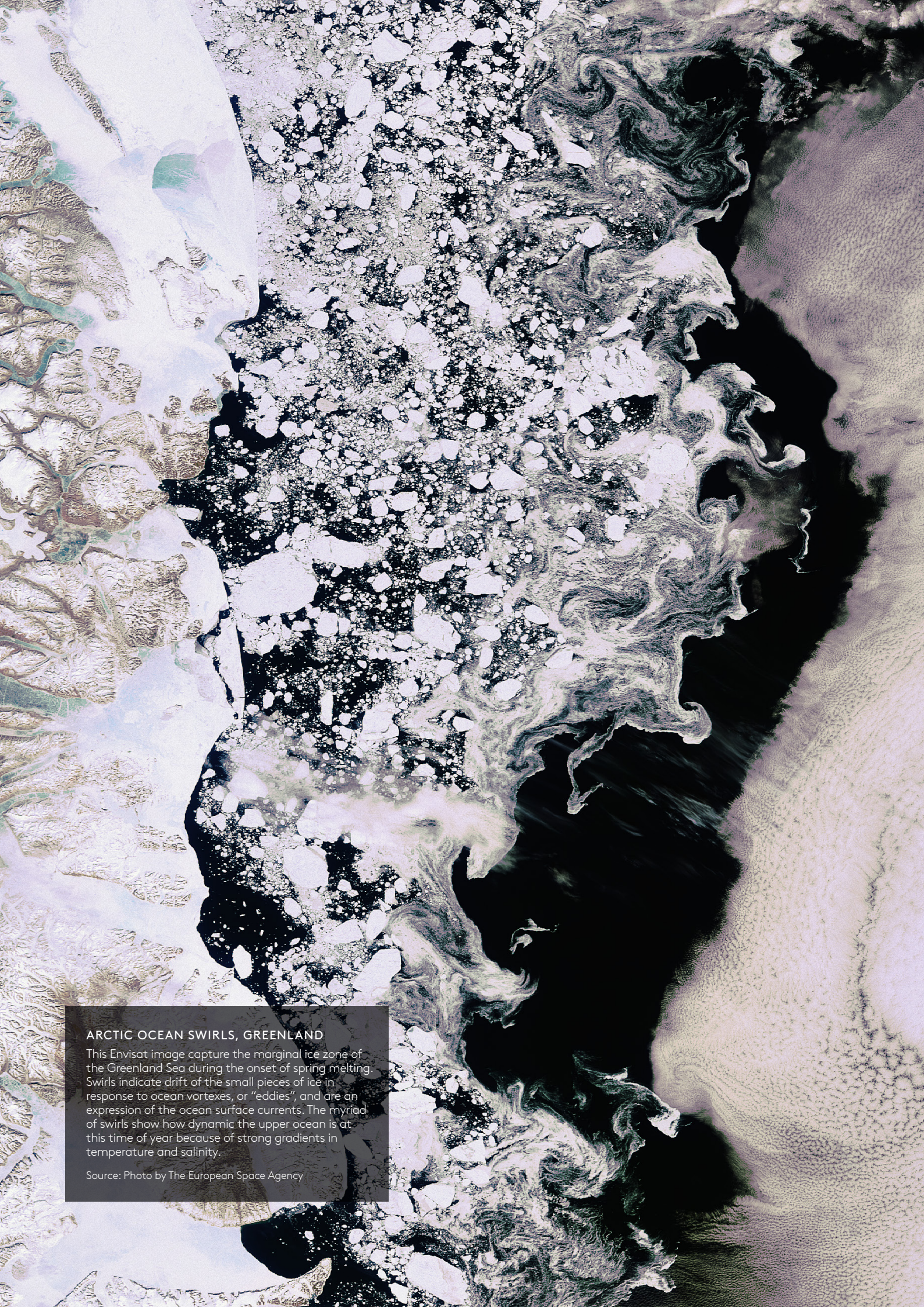
OUR RECOMMENDATION

Enhancing and improving water storage

ENHANCE AND IMPROVE THE QUALITY AND QUANTITY OF EXISTING AND NEW WATER STORAGE FACILITIES INCLUDING DECENTRALISED STORAGE SOLUTIONS, NATURE-BASED MECHANISMS (E.G. FORESTS AND WETLANDS) AND RECHARGING UNDERGROUND AQUIFERS IN ORDER TO MITIGATE AGAINST FUTURE PHYSICAL, ECONOMIC AND SOCIETAL WATER RELATED RISKS.

THIS SHOULD INCLUDE:

- continuing to support work in mitigating impact of climate change, recognising that increasing temperatures and changing weather patterns have a disproportionate impact on mountain ranges – the location of much of our natural freshwater storage, and on which much of the world's population relies for income, food and energy;
- identifying opportunities to deploy nature-based solutions including forestry, and create a set of best practice guidelines for managing and enhancing them in basins around the world;
- understand the opportunities (and challenges) of decentralised water storage systems, including assessing their pros and cons, for example, through the assessment of the St George Sharing Capacity project in Southern Queensland, and making a set of recommendations on options for deploying;
- looking at opportunities to recommend enhancement of underground water aquifers;
- including consideration of the impact of climate change in modelling of storage capacity and design;
- investing in new reservoirs or containment systems (including wetlands) to replenish existing ecosystems and provide new sources of water supply which are developed taking into consideration changing weather patterns; and
- recognising that retention of water in storage facilities (including river basins) is a complex balancing system of demand, forecast rainfall and recharge opportunities, work with engineers, hydrologists and economists to better understand the economic and environmental models that can more efficiently support decisions to help balance supply and demand for water. Implications of this modelling may include recommendations to restrict water use even in times of apparent surplus in order to facilitate supply recharge.



ARCTIC OCEAN SWIRLS, GREENLAND

This Envisat image capture the marginal ice zone of the Greenland Sea during the onset of spring melting. Swirls indicate drift of the small pieces of ice in response to ocean vortexes, or "eddies", and are an expression of the ocean surface currents. The myriad of swirls show how dynamic the upper ocean is at this time of year because of strong gradients in temperature and salinity.

Source: Photo by The European Space Agency

12. Awareness, leadership & communication

Awareness and communication of the global water crisis has been poor. Water by its nature has historically been siloed – both externally as water has failed to make its case for relevance to the other SDGs, and internally as, for example, the interests of sanitation have competed with those of scarcity.

This failure to develop a broader approach to communicating the global water challenge has been compounded by a tendency to focus on regional areas and basins rather than to take a view of the broader picture. The result has been that, without the type of public leadership from people such as Mark Carney, Governor of the Bank of England, or more recently Larry Fink, CEO of Blackrock, (both of whom issued key public statements on climate at critical inflection points in its history), or community leaders like Greta Thunberg, water has been pushed off the front pages of the media and to the bottom of the agenda for boards and policymakers. Rather than being seen as an issue itself, it is relegated to competing as one of many.

As many cities and towns have, or are running out of, water, and the data indicates a widening gap between where we are now and where we need to get to in order to meet our water financing, adaptation, technology, scarcity, WASH and water management targets, there is the basis for a far more organised campaign to communicate the "water emergency" that now exists.

Widespread acceptance of the need to act on climate change has developed from increased awareness of the issues through leadership and communication.

Over the last 30 years there have been as many global political leaders supporting strong action on climate change as there have been opposing it. The lack of public visibility and a coordinated global political leadership have been a direct barrier to climate action. When combined with a hostile media in some parts of the world that have run a denialist line on climate change, this only led to more challenges to articulate the science and the threat that climate change presents.

Nonetheless, the public awareness of climate change as an issue has been rapidly growing. In 2006, Al Gore's Oscar-winning "An Inconvenient Truth" was released and, for the first time, climate change and global warming were talked about in simple language, thus demystifying the IPCC reports. In addition, images and the direct impact of extreme weather – Hurricane Sandy (2012), the 2012 US drought and heatwave (the most extensive to affect

the USA since the 1930s and one where 123 people died), the California drought (worst on record) and subsequent wildfires, and in Australia the 2019/2020 bushfires along with the associated devastation – started to appear on the front page of newspapers and in the media with increasing recognition of the link between these events and climate change. The public became a direct witness to the impact of climate change on the environment immediately around them, when in the past it was more abstract.

These earlier events were then followed by IPCC reports that demonstrated with very clear messages just how large and catastrophic the problem was. The numbers were transparent, uniform and largely consensus driven. This reinforced the narrative and further built upon the clear target in the Paris Agreement of keeping a global temperature rise to "well below" 2°C above pre-industrial levels and "to pursue efforts" to limit the temperature increase even further to 1.5 °C - now further extended to the notion of net zero emissions by 2050. These represent a clear goal or action point ("North Star") behind which to mobilise action.

The increasing concerns around stability of the financial system and the willingness of corporates to speak out on climate change and to focus on achieving net zero emissions have all further reinforced the need for action. Finally, the acceptance of the existential threats posed by climate change have been further supported through civil disobedience with Extinction Rebellion and leadership from individuals like Greta Thunberg and David Attenborough. The term "Climate Emergency" is itself becoming mainstreamed and media coverage of climate change is escalating such that it is increasingly difficult to argue that climate change is not occurring.

Experience is showing that the adoption of simple, direct language and the use of clear images linking climate change to some of the world's most significant catastrophes have been invaluable. Going forward, climate proponents will likely link climate more closely to health and pollution in order to broaden the scope of coverage; ensure the smart use of social media to drive activism; adopt a common target (1.5 °C or net zero); develop comprehensive platforms designed to support and promote fact-checked information on climate; and enhance and support communication by and between nation states with high-profile spokespeople to ensure that their simple, key messages prevail.

LESSONS FOR WATER

The climate community has been extremely effective in adopting a simple, clear, unified set of messages which have broken communication barriers with both experts and the general population. By using high-profile and well-respected spokespeople to give these messages credibility, they have captured significant media attention, using this to help build momentum both publicly and within key influential sectors such as investors and corporates. As public awareness of the climate issue has risen, so too has the ready availability of data and information in forms and formats that are easily locatable, digestible, and shareable. Highly impactful images tell the story of climate change and how it impacts people. We see and understand how our planet is connected, and the actions of one person in one part of the world, impact us all.

The water community has much to learn from the climate movement. Internal divisions, lack of unity around a common goal, absence of highly impactful images that connect viewers to the water issue, or a simple narrative geared towards investors and corporate leaders about why action on water is more critical than the other (many) competing interests. This has meant that as a group, the water community has failed to generate the type of public buy-in that has been so critical to generating momentum for action on climate change.

There are important differences between the global climate movement and the global water movement. This includes that goals and targets for water are inherently local as opposed to global. Despite this, there remains scope for the water community to elevate the narrative of the criticality of water. With increasing global pressure on limited water resources, the time for complacency and division is over. The time to act, to create a unified, cohesive, well-articulated path forward that starts a movement for change on water, is now.

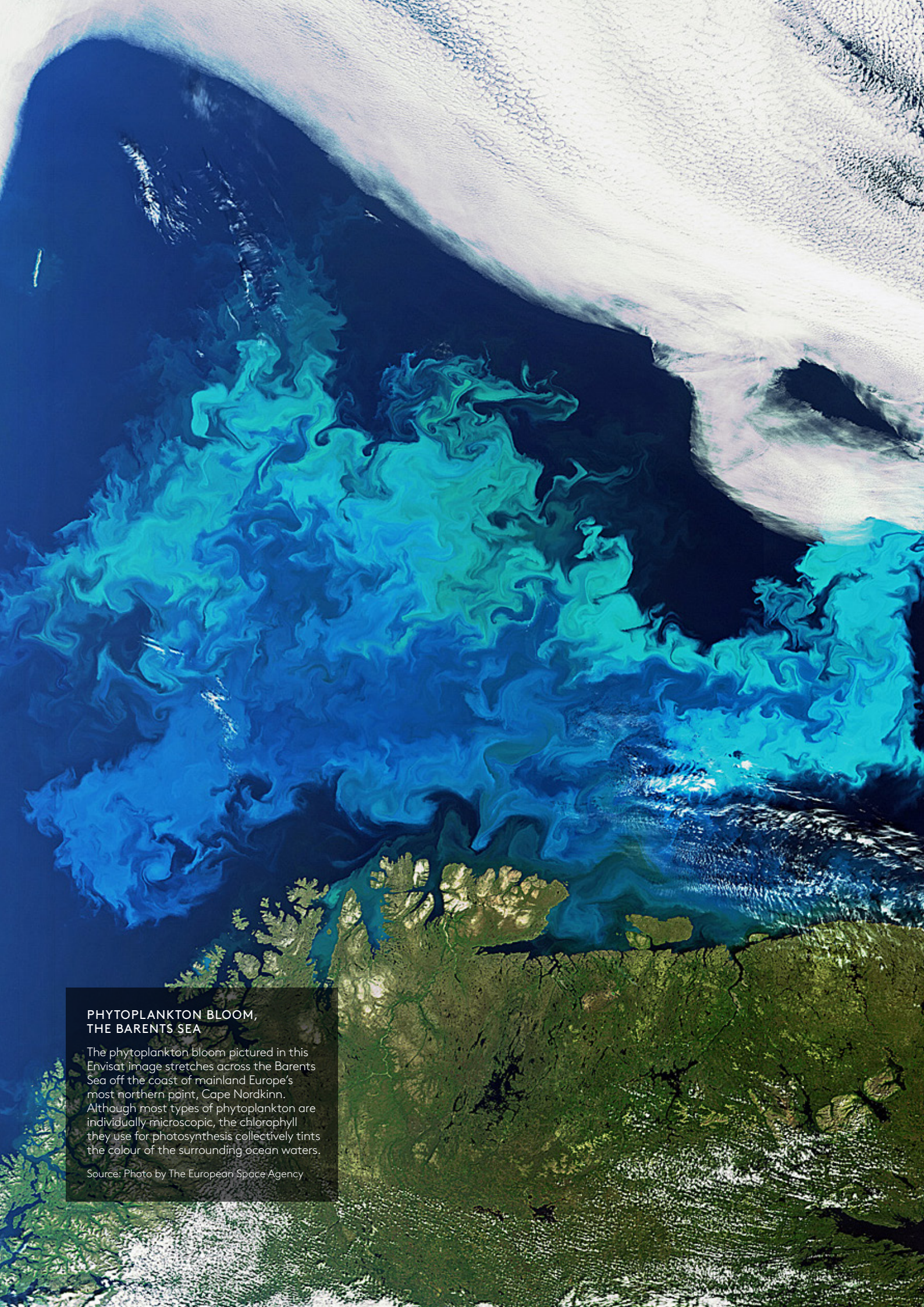
OUR RECOMMENDATION

Accelerating global and community action through a "North Star" for water

CREATE A GLOBAL COMMUNICATIONS CAMPAIGN FOCUSED ON UNIFYING THE WATER COMMUNITY AROUND A SINGLE "CLOSE THE GAP" NORTH STAR FOR WATER THAT LEVERAGES THE POWER OF STORYTELLING TO BOTH CREATE PUBLIC AWARENESS, AND TO DRIVE CORPORATE, INVESTOR AND POLICY ACTION IN ORDER TO DELIVER ON THE GOALS SET OUT IN SDG6.

THIS SHOULD INCLUDE:

- Working with key global non-profits, government stakeholders, thought and community leaders to create an independent third-party multi-stakeholder collaboration that:
  - implements a communications strategy around a commonly agreed aspirational goal ("North Star") for water (for example "Close the Gap") and encourages cross-sectoral and multi-level information sharing;
  - leverages expertise in the advertising and marketing sectors to develop and run a public relations and communications campaign that (a) connects to the broader community; (b) extends beyond science and data to popularise saving water; (c) creates a social movement that both helps drive policy and corporate change and reinforces such change by supporting and endorsing positive action;
  - uses public dialogue and debate to include, promote and encourage intergenerational leadership on water; and
  - uses human storytelling of real people in real places to highlight water issues and solutions as sources of greater connection, understanding and inspiration.
- Creating a media pledge whereby media organisations commit an identified percentage of their coverage/reporting to water-related issues.



PHYTOPLANKTON BLOOM, THE BARENTS SEA

The phytoplankton bloom pictured in this Envisat image stretches across the Barents Sea off the coast of mainland Europe's most northern point, Cape Nordkinn. Although most types of phytoplankton are individually microscopic, the chlorophyll they use for photosynthesis collectively tints the colour of the surrounding ocean waters.

Source: Photo by The European Space Agency

13. Water & pricing

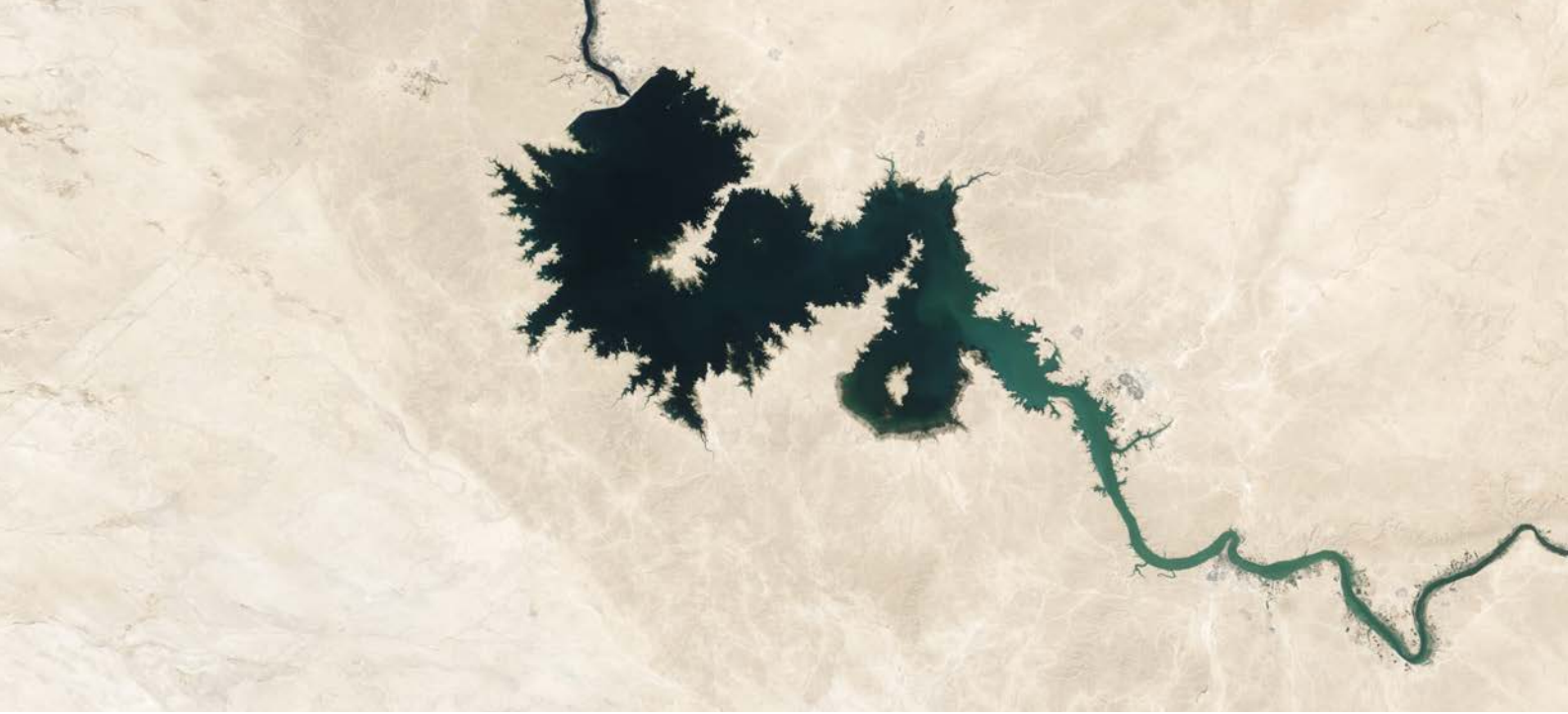
A final note here about an issue which frequently arises in water-related conversations: pricing and value. On a planet where water can be recognised as a human right, rivers given the status of a "person" and where in some places you can buy oil cheaper than you can buy water, addressing the issue of water's price or "value" is extremely complex.

As we have addressed elsewhere in this report, the use of value and pricing in climate can be applied to water, to more efficiently and effectively manage water resources. The creation of biodiversity credits and other paper-based mechanisms to put a value on what were previously identified as "externalities" also provide helpful indications of potential systems to support greater clarity on building a pricing and valuation system for water.

These are addressed at length in chapters 5, 7 and 8 and corresponding recommendations made about how the lessons learned from climate could be applied to resolving some of the outstanding issues on water regarding pricing and value - in these specific circumstances.

Drawing from the climate sector more broadly to extract new systems or ways of rethinking how to value and price water is difficult. Unlike carbon, water is integral to life and carries with it a series of social justice related considerations. Layered onto this is the key differentiator between the two systems – climate valuation and regulation is designed entirely around limiting its production. Water, on the other hand, needs pricing and valuation mechanisms which maximise its availability.

As a result, this report does not make specific recommendations as to lessons that can be learned from climate and applied to water in the broader context of pricing and valuation. Instead, reference should be made to discussions elsewhere in this report for specific issues such as the application of market-based mechanisms, and to the work of external third parties, such as the HLPF's Valuing Water Initiative, for a broader consideration of issues related to determining water's value.



QADISIYAH RESERVOIR, IRAQ

Qadisiyah was formed by the damming of the Euphrates River above Haditha, Iraq. It has 100 kilometres (62 miles) of shoreline and provides irrigation water for nearby cultivated fields.

Source: Photo by USGS on Unsplash

Conclusion

Water is critical for life. However, rapidly growing demand for increasingly limited supplies of freshwater are causing material water shortages around the world. As climate change continues to severely affect both global hydrological cycles and our population, food and energy requirements, the World Resources Institute forecasts that by 2030, without a wholesale adjustment in the way in which water resources are used and managed, demand for water will exceed supply by 56%.

It is hoped that the history, context, and key elements of the approach to climate change may provide insights and lessons for the global water crisis, beyond the traditional siloed approach traditionally adopted in dealing with water. The first step in this process will be to bring all stakeholders together in a cooperative and holistic manner, putting aside vested interests so that they may all work together to rapidly close the gap.

POLLINATION

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