Joint UN-Water Submission co-coordinated by UNICEF and SWA

Water and Sanitation Submission to the UAE – Belém work programme on indicators for measuring progress achieved towards the targets of the UAE Framework for Global Climate Resilience

1. Introduction and context

The Glasgow–Sharm el-Sheikh work programme COP 28 decision's on the global goal on adaptation (GGA) included the launching of a two-year UAE – Belém work programme on indicators for measuring progress achieved towards the targets established in paragraphs 9 and 10 of the Decision, with a view to identifying and, as needed, developing indicators and potential quantified elements for those targets.

At the same time, Parties and Observers were invited to submit, via the United Nations Framework Convention on Climate Change (UNFCCC) submission's portal, by March 31st 2024 views on the development of indicators and quantified elements for the GGA targets, as well as views on modalities of the UAE – Belém work programme (e.g. organization of work, timelines, inputs, outputs and the involvement of stakeholders).

This submission **by United Nations Water (UN-Water)** has been coordinated by UNICEF and the Sanitation and Water for All (SWA) Partnership. UN-Water is the coordination mechanism on water and sanitation, within the UN-system, bringing together the knowledge and experience of over 30 UN entities and over 40 partners. The joint submission ensures that the views of many different constituencies beyond the UN-System have been captured as it has gone through a wide set of parallel consultations:

- Consultation among UN-Water Members and Partners, coordinated by the UN-Water Expert Group on Climate Change, which is co-chaired by the World Meteorological Organization (WMO), United Nations Educational, Scientific and Cultural Organization (UNESCO), and The United Nations Economic Commission for Europe (UNECE). Important inputs to the submission come from organizations that belong to the Integrated Monitoring Initiative of the Sustainable Development Goal 6 (IMI-SDG6)
- The Core Partners of the Water for Climate Water Pavilion, through a consultation facilitated by the Stockholm International Water Institute (SIWI).[1]
- The Members of the SWA Climate Task Team, through a consultation organized by its co-chairs UNICEF and the Toilet Board Coalition.[2]

This submission is also endorsed by two global key initiatives that drive climate resilience across the world by mobilizing action from non-Party stakeholders and involving front-line communities: the Race to Resilience and the Sharm El Sheik Adaptation Agenda.

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[1] The following partners have provided inputs and formally endorsed the submission: Alliance for Global Water Adaptation (AGWA); Alliance for Water Stewardship (AWS); French Water Partnership; Simavi; International Water Management Institute (IWMI); The German Federal Ministry for Economic Cooperation and Development (BMZ)- Gesellschaft für Internationale Zusammenarbeit (GIZ)

[2] The following members of the SWA Climate Task Team have provided inputs and formally endorsed the submission: International Federation of Red Cross and Red Crescent Societies (IFRC); International Water and Sanitation Centre (IRC WASH); Stockholm International Water Institute (SIWI); Toilet Board Coalition; Climate Resilient Sanitation Coalition; UNICEF; World Health Organization (WHO); WHO-UNICEF Joint Monitoring Programme; Institute for Sustainable Futures - University of Technology Sydney (UTS-ISF); WHO Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS); WaterAid; Water.org.; Water for People.

After this introduction, the submission shares, in **Section 2,** the water community views in relation to the modalities of work of the UAE – Belém work programme, together with key messages that serve as conclusions. Those are building on lessons learned from the UN-Water Integrated Monitoring Initiative for the Sustainable Development Goal 6 (IMI-SDG6) and the technical work undertaken to develop Sections 3 to 5 of this submission. The document describes in **Section 3** the existing definitions and initial metrics considerations for each of the water elements that have been explicitly referred to under two of the seven thematic targets listed in paragraph 9 of the Decision (paragraphs 9a, and 9d). A case is also made, in **Section 4**, on how beyond the explicit references to water in those two targets, water needs to be considered as a cross cutting element that is essential to achieve climate adaptation, reduction of vulnerability and resilience within each of all other GGA thematic targets. This submission also describes in **Section 5** some considerations in relation to water and sanitation across the four UAE Framework targets that are centred around the iterative adaptation cycle, as listed in paragraph 10 of the decision. Finally, **Section 6** concludes the submission with important lessons learned from the UN-Water Integrated Monitoring Initiative for SDG 6 on creating meaningful and useful metrics, building capacity, and minimising the burden of reporting to countries.

The need for climate-informed transboundary management is highlighted throughout the document as it is particularly relevant for water and water-dependent sectors. This is in relation to paragraph 18 of the COP28 GGA decision that recognizes that climate change impacts are often transboundary in nature and may involve complex, cascading risks that can benefit from collective consideration and knowledge-sharing, climate-informed transboundary management and cooperation on global adaptation solutions.

2. Views on the modalities of work of the UAE – Belém work programme & key messages

The water community has gained large experience by developing global indicators for monitoring SDG 6 targets, and can demonstrate the value of following a **deliberate and rigorous process in developing a set of robust and tested indicators that can be applied globally** across all UN Members States. Experience has demonstrated as well how such process needs to be accompanied by a coordinated programme of capacity building and support, so that it results in data that can be used both for global aggregation, as an entry point for national policymaking and rationale for financial investments.

Such a process might prove similarly effective for the development of metrics for the UAE Framework for Global Climate Resilience, with the recognition of the need to find a balance between the technical state of the art in monitoring on one hand and practicality on the other.

Building on existing indicators it should be possible to avoid, at least to a certain extent, a "burden of reporting". Moreover, the UAE Framework for Global Climate Resilience could represent the place where a coherence among the existing (and eventually adapted) indicators under the various global frameworks come together. This will have the additional value of bringing further clarity on how to advance on the global goal on adaptation for enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change with a view to contributing to sustainable development. Advancing in this manner will allow the UAE Framework to establish a clear link with the existing financial mechanisms of the Paris Agreement, and will help address the existing gap in climate adaptation finance.

Following is a set of suggestions for consideration on the modalities of work of the UAE – Belém. Work programme. Those also serve as a conclusion of the more technical descriptions that have been developed in the sections 3 to 5 of this submission in relation to initial views on metrics:

- It is advised that the process of developing indicators within the UAE – Belém work programme starts in a technically robust manner and then final selection of indicators is made taking into account practical and political considerations.

- Thematic working groups should be convened for each thematic area. A potential thematic working group on water and sanitation could build on the indicator working groups employed by the existing SDG6 integrated Monitoring Initiative. Some additional experts may need to be included, in particular climate experts. The thematic working group on water and sanitation would further develop the concepts included in this paper. The process should also build on and use existing groups currently working on the integration of climate change into existing indicators (as described in this submission).
- It should be noted that because of the different water, sanitation, and transboundary elements captured under the UAE Framework, there might be a need to initially convene separated sub-groups for at least some of those elements. These sub-groups could quickly converge.
- The work programme should consider including thematic desk reviews, similar and further to the work advanced with this water and sanitation submission, and include online sectoral consultations to ensure the views of different constituencies are captured.
- Because of the cross-sectoral nature of water, it is proposed that water experts are part of other thematic working groups on the other GGA thematic areas and dimensional targets (this builds on what is explained in the sections 4 and 5 of this submission).
- There may be an overall reference group looking across all thematic groups to ensure synergies and avoid a siloed approach to indicator development.
- It is highly recommended to consider some form of indicator pilot testing.

The UN-Water, its Water Expert Group on Climate Change, as well as the Water and Integrated Monitoring Initiative for SDG6 stand ready to support and facilitate this process, especially if a thematic working group to advance metrics of the water and sanitation target is set up.

Initial views on metrics follow in sections 3 to 5, and other suggestions, building on lessons learnt from the UN-Water SDG6 Integrated Monitoring Initiative for SDG 6 are described in section 6 of this submission.

3. Initial views on metrics for the explicit water and sanitation references in GGA targets

Paragraph 9 of the Decision is dedicated to seven thematic targets that are to be achieved by 2030 and progressively beyond.

Paragraph 9a of the Decision is dedicated to water and sanitation, bringing together in the narrative of the target the following elements:

- 3.1 Significantly reducing climate-induced **water** scarcity;
- 3.2 Enhancing climate resilience to **water**-related hazards;
- 3.3 Towards a climate-resilient **water** supply, climate-resilient **sanitation**; and
- 3.4 Towards access to safe and affordable potable **water** for all.

In addition to this, paragraph 9d, dedicated to ecosystems and biodiversity, also makes an explicit reference to water:

- 3.5 [...] Accelerating […] management, enhancement, restoration and conservation and the protection of […] inland **water** […] ecosystems.

Following is an overview of emerging normative definitions for each of the elements defined under GGA paragraph 9a, as well as initial considerations for metrics. Metrics discussed in the submission are drawn from existing monitoring mechanisms to the extent possible, bearing in mind Paragraph 16 of the decision to not increase the reporting burden on countries. The analysis also includes references to transboundary water management observing that paragraph 18 of the GGA decision recognizers that climate change impacts are often transboundary in nature and may involve complex, cascading risks that can benefit from collective consideration

and knowledge-sharing, climate-informed transboundary management and cooperation on global adaptation solutions.

3.1 Significantly reducing climate-induced water scarcity

According to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6), **water scarcity and water insecurity are related concepts but not identical**, and each has a range of interpretations leading to some overlap. **Water scarcity can be broadly described as a mismatch between the demand for freshwater and its availability, quantified in physical terms**. Some **definitions of water scarcity** also incorporate broader issues.

For example, in IPCC AR6 **economic water scarcity** has been defined as a situation where human, institutional, and financial capital limit access to water, even though water in nature is available locally to meet human demands. Economic water scarcity can also occur where infrastructure exists, but water distribution is inequitable. Much of the literature exploring the impacts of climate change on water security, focuses on quantifying physical water scarcity.

A commonly used measure of physical water scarcity is the **Falkenmark index** which measures the amount of renewable freshwater available per capita. However, IPCC considers that the Falkenmark index is as an incomplete measure, as it does not account for water needed for non-human needs (e.g. the environment)**.** Using a water scarcity index defined as the ratio of demand and availability, and accounting for non-human needs, it is estimated that 4 billion people live under conditions of severe water scarcity for at least one month per year (Mekonnen and Hoekstra, 2016) and many of them are likely living in transboundary basins where 40% of world's population is located (UNECE, 2009 and 2015, Adaptation Fund, 2022).

Quality-induced water scarcity is an additional factor beginning to be considered for different uses (as different water quality is necessary for different uses). Recent analysis has found that current and future water scarcity becomes a substantially more severe issue globally when assessing "clean-water scarcity" (Wang, M. et al. 2024).

Although many regions with high water scarcity are already naturally dry, human influence on climate is leading, according to the IPCC AR6, to reduced water availability. However, it must be noted that many 'wet' regions also undergo high water scarcity. Global maps highlighting both physical and economic water scarcity show that wet regions are also water scarce (suffering from an economic manifestation of water scarcity).

While, a conclusion in the AR6 is that quantification of the contribution of anthropogenic climate change to current levels of water scarcity is not yet available, the report expresses high confidence that improving societal aspects of water management will be key in adapting to climate change-driven increases in water scarcity in the future.

Aligned to these conclusions are the **recently published Green Climate Fund Water Security Guidelines**, that adopt the 2013 UN-Water working definition of water security: "The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability."

The GCF Guidelines recognize that climate change, rapid urbanization, population growth, energy demand, food production and pollution **are all contributing** to increased water scarcity. GCF proposes then a climate adaptation financing pathway towards responsible and sustainable water management relying not only in more 'hard' infrastructure but through a combination of (i) saving water through water conservation, water efficiency, non-revenue water reduction, and water re-use and water recycling; (ii) educating the public and policy-makers; (iii) allocating

scarce water resources through proper regulation; and (iv) a well-managed mix and integration of the Grey-Green Infrastructure[3] to enhance the adaptability and resilience of coastal and upstream communities to climate change (drought and flooding).

Considering this, and in relation to potential **metrics towards "significantly reducing climate-induced water scarcity"** the SWA and Partners submission to the GGA Work Programme in March 2023 recommended that a strong baseline can consist of some of the existing Sustainable Development Goal (SDG) 6 indicators:

- **SDG Indicator 6.4.2 (Tier I)[4]: "Level of water stress: freshwater withdrawal as a proportion of available freshwater resources".** The Food and Agriculture Organization (FAO) is the custodian of this indicator, and suggests that its disaggregated value by basin, and also its temporal disaggregation by season, can much better relate to water scarcity.
- **SDG Indicator 6.4.1 (Tier I): "Change in water-use efficiency (WUE) over time"**. The FAO is the custodian of this indicator and indicates that while the value of WUE, as such, is not much indicative of the risk of water scarcity, what would need to be considered is the decoupling of water use from economic development (on-going work at FAO).
- **SDG Indicator 6.5.1 (Tier II)**: **"Degree of integrated water resources management implementation (0-100)".** UNEP is custodian of this indicator and indicates that it could be adapted from the SDG 6.5.1 survey question 3.1b on degree of implementation of sustainable and efficient water use management instruments) (see section 3.2 of this submission for an elaborated discussion on SDG 6.5.1).
- **SDG Indicator 6.3.1 (Tier II): Proportion of domestic and industrial wastewater flows safely treated.** The World Health Organization (WHO), the United Nations Human Settlements Programme (UN-Habitat) and the United Nations Statistics Division (UNSD) are the custodians of this indicator.
- **SDG Indicator 6.3.2 (Tier II): Proportion of bodies of water with good ambient water quality.** The United Nations Environment Programme (UNEP) is the custodian of this indicator and suggests that greater value, in terms of GGA metrics, could be derived from the metadata that UNEP collects from countries. This could be framed around the 'readiness for adaptation' based on a country's capacity to monitor and assess national water quality trends. Through the implementation of this SDG 6.3.2 indicator, it is very clear that many countries have insufficient water quality monitoring to robustly report on water quality at the national scale – and are therefore unprepared for supporting climate adaptation. If considered, for GGA metrics this information can be drawn directly from the SDG indicator 6.3.2 metadata collected and would introduce no additional burden to countries.

To address the issue acknowledged by the IPCC that quantification of the contribution of anthropogenic climate change to current levels of water scarcity is not yet available, an initial step could be to map the areas (globally and nationally) where water scarcity overlaps with high exposure to climate-related hazards (e.g. droughts, floods, change of hydrological regime etc.) and track progress there towards the SDG indicators mentioned above as a means to also track progress towards "significantly reducing climate-induced water scarcity".

This is what UNICEF has done recently using water risk data from the World Resources Institute (WRI) and drought events data from the Global Data Risk Platform of the United Nations

[3] **Green infrastructure** refers to natural systems including forests, floodplains, wetlands and soils that provide additional benefits for human well-being, such as flood protection and climate regulation. **Gray infrastructure** refers to structures such as dams, seawalls, roads, pipes or water treatment plants.
[4] SDG indicators are classified into **three "tiers"** to show their status: **Tier I** denotes that an indicator is both conceptually clear and available data exists for its measurement. A **Tier II** indicator has a clear methodology but inadequate data. If an indicator is classified as **Tier III**, it requires methodological development.

Environment Programme (UNEP).[5] **A water scarcity index has been created by overlapping and mapping:** 1. Baseline water stress, which measures the ratio of total water withdrawals to available renewable surface and groundwater supplies (as per SDG 6.4.2 indicator); 2. Drought events; 3. Interannual variability, which measures the average between-year variability of available water supply, including both renewable surface and groundwater supplies; 4. Seasonal variability, which measures the average within-year variability of available water supply; 5. Groundwater table decline, which measures the average decline of the groundwater table[6].

Potential additional considerations for metrics in the overlap of water scarcity and high exposure to climate hazards:

- Volume of water saved per year (compared to baseline)
- Volume of water reused (defining what reuse consist of and compared to baseline)
- Volume of treated wastewater recycled and reused (compared to baseline)
- Number of countries that have developed and implemented regulatory measures for water demand management, water reuse, circularity (and other measures related to reducing water scarcity) (could be adapted from the SDG 6.5.1 survey question 3.1b (see above)).
- Number of countries that have developed and implemented water demand management strategies that factor in the human rights to safe drinking water and sanitation.
- Number of countries with enhanced communication and public awareness mechanisms for adequate water conservation, reuse and efficiency (could be adapted from the SDG 6.5.1 survey question 3.1b (see above)).
- Number of people benefited from interventions targeting water conservation, efficiency and reuse. (compared to baseline)
- Number of countries with measures to integrate green and grey infrastructure into national policy and budgeting (compared to baseline)
- Number of water-sensitive risk assessments integrated into decision making, program prioritization, and project development of investment and resource management institutions. Linked to: number of regulations and guidelines that mandate the use of those assessments, and they are repeated at regular intervals to track change
- Percentage of climate adaptation finance invested in projects to address all (or some of) the above.

In addition to the SDG indicators discussed above, it is important to consider that the Environment Statistics Section of the United Nations Statistics Division (UNSD) is engaged in the development of methodology, data collection, capacity development, and coordination in the fields of environmental statistics and indicators. Similar data collection efforts are being made by OECD and Eurostat. Since 2018, these three initiatives have been coordinating to harmonize their data collection tools, and to avoid that countries are asked to complete multiple similar questionnaires. The OECD and Eurostat questionnaires are nearly identical, and have just minor differences from the UNSD questionnaire.

The following are indicators in relation to "**Inland Water Resources" from the Global Set of Climate Change Statistics and Indicators that could be considered, in areas highly exposed to climate impacts, against this element of the GGA water target**[7]:

- Fresh groundwater abstracted
- Fresh surface water abstracted
- Freshwater abstracted
- Freshwater abstracted as proportion of renewable freshwater resources

[5] The climate crisis is a child rights crisis: Introducing the Children's Climate Risk Index - UNICEF DATA (see from page 31)
[6] The International Groundwater Resources Assessment Centre (IGRAC) compiles groundwater table data of more than 30 countries (the number is growing) here: https://ggis.un-igrac.org/view/ggmn/
[7] These parameters are also available at AQUASTAT - FAO's Global Information System on Water and Agriculture

- Inflow of surface and groundwaters from neighbouring countries
- Internal flow
- Renewable freshwater resources
- Renewable freshwater resources per capita
- Wastewater generation and treatment
- Water resources

While the initial step for metrics on reducing climate-induced water scarcity could be, as explained above to map the areas where water scarcity overlaps with high exposure to climate-related hazards and track progress there towards existing SDG indicators WMO indicates that further than that and for countries to report on climate-induced water scarcity, there is a need to monitor how climate change factors are influencing the hydrological cycle and therefore the status of water resources at different levels. Indeed, national meteorological and hydrological services (NMHSs) are currently collaborating to increase this understanding. NMHSs are developing their capacities to gather crucial hydrological indicators, as the changes in river discharge, reservoir inflow, groundwater levels, soil moisture and evapotranspiration, changes in the cryosphere, among others. The data for the indicators are gathered at different levels depending on their availability, from on the ground measurements, satellites, and models. These indicators are compiled by WMO in the State of Global Water Resources report and in the implementation of the WMO hydrological status and outlook system (HydroSOS), which offers a comprehensive and consistent overview of water resources worldwide, highlighting the influence of climatic, environmental and societal changes on the hydrological variables. By analysing various aspects such as distribution and quantity across time and space, the report serves as a valuable resource for policymakers, water managers and disaster risk reduction efforts, fostering a better understanding of climate-induced water scarcity and hazards.

Box 1. Transboundary Water Cooperation and Climate Change

Worldwide, 153 countries share rivers, lakes and aquifers, and 286 river basins and 592 aquifers cross sovereign borders (UNECE, 2018). Transboundary basins account for an estimated 60 per cent of global freshwater flow, and are home to more than 40 per cent of the world's population (UN Water, 2008).

While transboundary water is not a thematic GGA target, the article 18 of the Decision adopted at COP28 "Recognizes that **climate change impacts are often transboundary in nature** and may involve complex, cascading risks that can benefit from collective consideration and knowledge-sharing, climate-informed transboundary management and cooperation on global adaptation solutions".

The existing SDG indicator 6.5.2 **"Proportion of transboundary basin area with an operational arrangement for water cooperation"** can be used to track adaptation measures of transboundary water cooperation worldwide. In 2023-2024, the third reporting exercise is ongoing and UNESCO and UNECE, as co-custodian agencies of this indicator, have approached 153 countries sharing transboundary waters for updated information. As of 30 January 2024, 129 replies had been received. Data has been submitted to the UN statistical commission in March 2024. In addition, by Summer 2024, a progress report will be prepared. The thematic focus of the third progress report will be climate change, disaster risk reduction and transboundary cooperation. The report will be ready by June2024. The SDG indicator 6.5.2 is also included as a complementary indicator to the monitoring framework for the Kunming-Montreal Global Biodiversity Framework (GBF).

Based on SDG indicator 6.5.2 the following aspects can be assessed:

- Number/percentage of countries that reported that at least one / half/ all of their transboundary basins have coordinated or joint alarm system for floods
- Number/percentage of countries that reported that at least one / half/ all of their transboundary basins have coordinated or joint alarm system for droughts

- Number/percentage of countries that reported that at least one / half/ all of their transboundary basins have a joint climate change adaptation strategy
- Number/percentage of countries that reported that at least one / half/ all of their transboundary basins have a joint disaster risk reduction strategy
- Number/percentage of countries that reported that at least one / half/ all of their transboundary basin agreements/arrangements include such topics as:
  - Cooperation in addressing floods
  - Cooperation in addressing droughts
  - Climate change adaptation
  - Data collection and exchange
  - Common early warning and alarm procedures
- Number/percentage of countries that reported that at least one / half/ all of their transboundary joint bodies/mechanisms include such topics as:
  - Data collection and exchange
  - Management and prevention of flood or drought risks
  - Preparedness for extreme events, e.g., common early warning and alarm procedures
  - Climate change adaptation
- Number/percentage of countries that reported to have regular exchange of climatological information and data and/or information on flows or water levels (including groundwater levels) with other riparian countries in at least one / half/ all of their transboundary basins

In addition, within UAE Framework it would be beneficial to consider transboundary and regional water cooperation as an opportunity to better understand transboundary climate change impacts and risks and to support collective consideration and knowledge-sharing resulting in climate-informed transboundary management on the basin and regional levels (UNECE, 2015, Adaptation Fund, 2022). It will also help to build trust between countries, improve data exchange as well as accuracy of modelling and forecasting and, consequently, facilitate funding for developing and implementing national climate policies such as National Adaptation Plans and Nationally Determined Contributions. Transboundary basin and regional organisations can play a key role in this process (UNECE, 2015, World Bank, 2019). Therefore, it would be beneficial to integrate the following elements into monitoring the progress in adaptation:

- Number of current climate impacts and vulnerability assessments and adaptation strategies and plans (covering also floods and droughts) developed at transboundary basin level or on the regional level;
- Number of current transboundary and regional organisations which work on climate change adaptation (incl. floods and droughts);
- Number of transboundary river basin and flood management plans which integrate climate change adaptation;
- Number of transboundary basin and regional adaptation projects.

Furthermore, it would be useful to collect best practices in a qualitative way and to share them. The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) and, in particular, its Task Force on Water and Climate could provide support and inputs to the process of monitoring progress in adaptation from a transboundary perspective (for example, based on the reporting on SDG indicator 6.5.2 and the regular reports of the Global network of basins working on climate change (UNECE and INBO, 2023). Information on the number of transboundary basin and regional adaptation projects could be potentially provided by the climate funds and other donors. Any indicator on transboundary cooperation would be applicable to those 153 countries sharing transboundary waters.

In addition, the SDG indicator 6.5.1 survey on implementation of Integrated Water Resources Management (IWRM) has 4 transboundary level questions on the degree of implementation of: (i) transboundary agreements; (ii) transboundary institutional arrangements; (iii) transboundary data and information sharing; (iv) transboundary financing. These questions could be modified to support the GGA indicator framework. The 2024 SDG 6.5.1 progress report will also focus on

climate, and UNEP, as the indicator custodian will look to strengthen the inclusion of climate in the 6.5.1 survey in subsequent reporting rounds.

3.2 Enhancing climate resilience to water-related hazards

Water-related hazards encompass a range of dangerous situations or conditions related to water, both natural and man-made. Those include weather and climate related water hazards such as tropical cyclones, floods, drought, heatwaves, wildfires, cold spells, coastal storm surges, glacier lake outburst floods, and heavy rainstorms, as well as others that are not related to the climate such as tsunamis. A water hazard may also be a biological or chemical agent or physical property of water that has the potential to cause injury or illness to an individual or impact the environment. **Water-related hazards are particularly sensitive to even small shifts in climate**, so that the frequency, magnitude and intensity of these hazards are shifting over time (Milly et al., 2005).

WMO has recently reported that **most disasters are water-related and climate change is increasing their frequency and severity**. Indeed, since 2000, flood-related disasters have increased by 134%, and the number and duration of droughts also increased by 29% (WMO, 2021b). Between 1970 and 2019, 11,072 disasters attributed to weather-, water-, and climate-related hazards, have involved 2.06 million deaths and US$ 3.6 trillion in economic losses (WMO, 2021a). Water-related hazards do not recognize borders, pose transboundary risks, and require cooperation to address them.

The GCF Water Security Sectoral Guide indicates that the vision for a paradigm shift in water security for managing **water-related hazards** differs depending on the location and the type of hazard.

Table 1. Examples of sensitive elements of water supply, sanitation and hygiene towards climate-induced water-related hazards (adapted from the Water Guidelines of the Green Climate Fund[8])

Climate-induced change	Water-related hazard	Sensitive elements of water supply, sanitation, hygiene (WASH services)
Decrease in area of available surface water	Drought	Both seasonal and permanent surface water bodies decrease in size reducing available water sources
Decrease in net precipitation	Drought	Reduction in raw water supplies, reduced flow in rivers, lower groundwater levels, less dilution/increased concentration of pollutants in water, challenge to sanitation systems and hygiene practices
Increase in precipitation and/or storms	Increased frequency and magnitude of riverine flooding and/or local urban flooding (incl. flash floods)	Pollution of wells, inundation of wells, inaccessibility of water sources, flooding of pit latrines, and septic tanks combined sewer overflows, physical damages to infrastructure, landslides around water sources, sedimentation and turbidity, challenges to sustainability of sanitation and hygiene behaviours, and water borne diseases

[8] The table displayed in the GCF Water Security Guide Annex 2 and reproduced here is an adapted version of the Global Water Partnership – UNICEF Strategic Framework for Climate Resilient Water, Sanitation and Hygiene Development.

Change in precipitation type (rain, snow, ice etc.) and seasonality	Changed pattern of high and low flows	Reduction in water supply through different recharge of water storages, changed seasonality or extend of floods and droughts, impacts on water quality
Sea level rise and storm surge	Coastal zone flooding and saltwater intrusion into freshwater aquifers, or river mouths	Reduction in availability of drinking water, with high impacts on quality Increase of the cost of drinking water, especially for the most vulnerable. Reduced functionality of coastal wastewater treatment systems
Increase in temperature	Heatwaves and extreme high temperatures	Damage to infrastructure, increase in pathogens in water and sanitation systems leading to increased risk of disease
Increase in temperature	Melting and thawing of glaciers, snow, sea ice and frozen ground (permafrost)	Seasonality of riverine flows affected leading to a reduction in water availability (for domestic water supply, toilet flushing and sewer conveyance) in warmest months
Compound climate effect: increase in temperature and change of spatial-temporal pattern in net precipitation	Growing water stress	Imbalance between the naturally renewable water supply and (growing) water demand due to higher evapotranspiration (e.g., for irrigated agriculture and nature) and increased anthropogenic water use introduce significant trade-offs among water users

The GCF highlights the requirements for sustained participation in planning and management; improved coverage and application of digital solutions; increased acceptance and use of non-traditional financing mechanisms; and environmentally sound use of structural measures to increase resilience. The GCF (as well as several studies and reports) also indicates that **ecosystem-based management** and smart systems provide opportunities to mitigate water-related hazards with a climate cross-cutting impact potential combined with sustainable development co-benefits.

Considering this, and in relation to potential **metrics towards "enhancing climate resilience to water-related hazards",** existing sources of potential indicators and data include:

1. The Sendai Framework online Monitoring Tool;
2. The related Early Warnings for All Initiative dashboard; and
3. SDG indicator 6.5.1 on Integrated Water Resources Management (IWRM).

3.2.1. Sendai Framework monitoring

The Sendai Framework for Disaster Risk Reduction 2015–2030 includes seven targets and four priorities for action to reduce the occurrence and impact of disasters resulting from natural hazards. A set indicators, recommended by an Open-ended Intergovernmental Expert Working Group (OIEWG), are used to track progress in implementing its targets as well as its related dimensions reflected in the Sustainable Development Goals 11. UN Member States report their progress through the Sendai Framework Monitor (SFM).The online platform is also a tool to guide risk-informed policy decisions and to allocate resources accordingly towards reducing risk.

While none of the seven Sendai Framework targets refer to water explicitly, there are two of them that can relate to a certain extend to the GGA water target reference to "enhancing climate resilience to water-related hazards", especially when looking at some of their associated indicators to measure progress:

- **Sendai Framework Target D** calls to "Substantially reduce disaster damage to **critical infrastructure and disruption of basic services**, among them health and educational facilities, including through developing their resilience by 2030".
    - Indicator D-1: Damage to critical infrastructure attributed to disasters
    - Indicator D-4: Number of other destroyed or damaged critical infrastructure units and facilities attributed to disasters
    - Indicator D-6: Number of disruptions to educational services attributed to disasters
    - Indicator D-7: Number of disruptions to health services attributed to disasters
    - Indicator D-8: Number of disruptions to basic services attributed to disasters

  The report of the OIEWG on indicators and terminology relating to disaster risk reduction defines critical infrastructure as "the physical structures, facilities, networks and other assets which provide **services that are essential to the social and economic functioning of a community or society**". Such definition clearly includes water and sanitation infrastructure, but the decision regarding those elements of critical infrastructure to be included in the calculation of the indicators is left to the Member States and is described in the accompanying metadata to the monitoring system. The instructions by the OIEWG are that protective infrastructure and green infrastructure should be included where relevant.
- **Sendai Framework Target E** calls to substantially increase the number of countries with national and local disaster risk reduction strategies.
    - Indicator E.1 National average score for the adoption and implementation of national disaster risk reduction strategies in line with the Sendai Framework.
    - Indicator E.2 Percentage of local governments that have adopted and implemented local disaster risk reduction strategies in line with national strategies.

It is important to note that the Sendai Framework monitoring of its targets D and E is intended to complement monitoring of SDG11 and 13 indicators. The following are important interconnections:

- Damage to critical infrastructure and number of disruptions to basic services, attributed to disasters: SDG Indicator 11.5.3 and Sendai Framework Indicator D1.
- Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030: SDG Indicator 11.b.1, SDG Indicator 13.1.2, and Sendai Framework Indicator E1.
- Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies: SDG Indicator 11.b.2, SDG Indicator: 13.1.3, and Sendai Framework Indicator E2.

Where the Sendai Framework includes explicit references to water is among the four priorities for action to reduce the occurrence and impact of disasters resulting from natural hazards.

- **Sendai Framework Priority 4:** Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.
    - **National and local levels:** [...] To promote the resilience of new and existing **critical infrastructure, including water,** transportation and telecommunications infrastructure, educational facilities, hospitals and other health facilities, to ensure that they remain safe, effective and operational during and after disasters in order to **provide live-saving and essential services**.

- **Global and regional levels:** [...] To support, as appropriate, the efforts of relevant United Nations entities to strengthen and **implement global mechanisms on hydrometeorological issues** in order to raise awareness and **improve understanding of water-related disaster risks** and their impact on society, and advance strategies for disaster risk reduction upon the request of States

There are no indicators associated though to measure progress towards the Sendai Framework Priorities.

3.2.2. Early Warnings for All Initiative (EW4All)

In 2022, the UN Secretary-General called for every person on Earth to be protected by early warning systems by 2027. According to the World Meteorological Organization (WMO) and the United Nations Office for Disaster Risk Reduction (UNDRR), advances in early warning systems and preparedness have saved tens of thousands of lives and hundreds of billions of dollars. People-centred, end-to-end, water-hazard early-warning systems can help minimize the harm to people, assets, and livelihoods by triggering early action that is well-prepared and tested. Yet, WMO has reported that as of 2022, only half of countries globally are protected by multi-hazard early warning systems. The numbers are even lower for developing countries; less than half of the Least Developed Countries and only one-third of Small Island Developing States have a multi-hazard early warning system. Furthermore, if systems are in place, they do not always protect all members of society.

In November 2022, an Executive Action Plan was launched at COP27 to implement the initiative and designated as the co-leads the WMO and UNDRR. Within the Early Warnings for All Initiative / Early Warnings for All Initiative dashboard indicators capture the global impact of natural disasters and the status of Multi-Hazard Early Warning Systems.

The dashboard is the product of the global cooperation on the Initiative, with partners who put together data, sources and methodologies towards the creation of an online monitoring tool. The dashboard presents selected monitoring indicators structured along three categories:

- **Global indicators:** metrics that capture the Initiative's impact on the availability of end-to-end, people-centred multi-hazard early warning systems. The data is based on official reporting mechanisms, such as the Sendai Framework online Monitoring Tool, and information from the WMO Monitoring System.
- **Implementation indicators:** metrics based on the Initiative's monitoring and evaluation framework. Along with the cross-cutting indicators on the enabling environment, **a subset of them includes references to water-related hazards such as:**
    - Country Hydromet Diagnosis conducted.
    - Assessment for End-to-End Flood Forecasting
    - WMO monitors the presence of national disaster risk reduction (DRR) coordination platforms where NMHS (National Meteorological and Hydrological Services) participate.
    - WMO monitors the number Countries supported for the provision of hydrological status and outlooks (HydroSOS)
    - Coverage of centres providing advisories and guidance for severe weather, tropical cyclones, and flash-floods. WMO tracks the number of members with established procedures for issuing water-related hazard warnings.
- **Country capacity indicators:** baseline data on the early warning capacity of the roll-out countries. It should be noted that priority should be for those countries contributing the least and being impacted the most.

Following are specific EW4All indicators tracking water resilience:

- **Observation Networks (2.1):** WMO monitors the number of countries with multi-hazard monitoring systems and stations sharing data internationally. This ensures comprehensive data collection for water-related hazards like floods and droughts.
- **Data Exchange and Access (2.2):** WMO tracks the percentage of members exchanging core observation data and using satellite data for water hazard monitoring. This facilitates improved data-driven decision-making.
- **Forecast Product Utilization (2.3):** WMO monitors the number of members with the capacity to utilize forecast products effectively. This empowers countries to translate hydrometeorological data into actionable insights for water management.
- **Impact-Based Forecasts (2.4):** WMO tracks the number of members producing impact-based warnings for water hazards. This ensures communities receive clear and actionable information to prepare for floods, droughts, and other water-related events.

3.2.3. SDG Indicator 6.5.1 survey

SDG 6.5.1 survey (implementation of Integrated Water Resources Management (IWRM)) question 3.2e refers to the "**Degree of implementation of management instruments**[9] **to reduce impacts of water-related disasters (0-100)".** Data has been collected roughly every 3 years (2017, 2020, 2023). To date, 191 countries have reported on this question in the survey, with 183 countries reporting in 2023. Countries are asked to provide a score on a scale of 0-100, in increments of 10, based on threshold descriptions provided. In addition, countries are asked to provide free text on: (a) Status and progress; (b) Climate change considerations; and (c) Way forward. The global average score on this question has slowly increased from 53 (2017) to 56 (2020) to 58 (2023). The question format allows countries to describe the 'management instruments' that are most relevant in their country. The question text could be modified slightly to better serve the GAA indicator framework. The United Nations Environment Programme (UNEP) is the custodian of this indicator.

In addition to the above existing indicators and metrics, other potential indicators **towards "enhancing climate resilience to water-related hazards** "could include:

- Number of extreme events – floods and droughts
- Percentage of land affected by drought or floods
- Number of countries with prevention, response and financing strategies to climate induced water-related hazards
- Number of countries with strategies on the use of green/grey infrastructure /use of nature-based solutions as climate adaptation option to address water-related hazards
- Existence of plans and mechanisms for the integration of strategies on water-related hazards and infrastructure (grey-green) across national development plans to assess and reduce vulnerabilities across sectors. (Indicators and plans for community resilience and economic resilience resulting from these strategies can be developed).

Considering that **cooperation on shared waters can help to improve preparedness to water-related hazards, and, particularly, to floods and droughts** (UNDRR, 2018), some of the indicators highlighted in Box 1 on "Transboundary Water Cooperation and Climate Change" should be also considered. Specially those that can help track progress towards the development of shared information systems or data exchange across sectors and better communication between countries.

[9] Examples of 'management instruments' include: understanding disaster risk; strengthening disaster risk governance; investing in disaster risk reduction; and enhancing disaster preparedness.

3.3 Towards a climate-resilient water supply and climate-resilient sanitation

The Sustainable Development Goal 6 aims at ensuring availability and sustainable management of water and sanitation for all and includes ambitious targets for "achieving universal and equitable access to safe and affordable drinking water" (target 6.1), and "equitable sanitation and hygiene for all" (target 6.2) by 2030. Key related definitions to monitor progress towards those targets include the globally and sector wide agreed definitions by the WHO-UNICEF Joint Monitoring Program:

Drinking Water: refers to water used, or intended to be available for use, by humans for drinking, cooking, food preparation, personal hygiene and other essential domestic purposes.

- **Improved water sources (Indicator from the Millenium Development Goal agenda):** those with the potential to deliver safe water by nature of their design and construction.
- **Basic service (SDG 1.4.1):** Drinking water from an improved source, provided collection time is not more than 30 minutes for a roundtrip including queuing.
- **Safely managed service (SDG 6.1.1):** Drinking water from an improved water source that is accessible on premises, available when needed, and free from faecal and priority chemical contamination.

Sanitation: refers to the provision of facilities and services for the safe management and disposal of human urine and faeces.

- **Improved sanitation facilities (Indicator from the Millenium Development Goal agenda:** those designed to hygienically separate excreta from human contact.
- **Basic service (SDG 1.4.1):** Use of improved facilities which are not shared with other households.
- **Safely managed service (SDG 6.2.1a):** Use of improved facilities that are not shared with other households and where excreta are safely disposed of in situ or removed and treated offsite

Hygiene: is multi-faceted and can comprise many behaviours, including handwashing, menstrual hygiene and food hygiene. To date, global monitoring has focused on handwashing with soap and water, though there is steady growth in data on menstrual hygiene. It should be noted that hygiene is an essential first line of defence against the spread of infectious disease when populations are faced with increased water scarcity and floods.

- **Basic service (SDG 6.2.1b):** Availability of a handwashing facility with soap and water at home.

The Green Climate Fund (GCF) paradigm shift for climate-resilient water supply and climate-resilient sanitation describes in its Water Security Guides that: "**Climate resilient water supply, sanitation and hygiene (WASH)** applied to the full water cycle in a sustainable way and implementing climate risk smart innovation technologies, will lead to health improvements, better agricultural livelihoods, reduction of environmental risks, low-energy emissions and generates more-income activities, and as such performs a shift to building more resilient communities."

To promote the envisioned enhancement of climate-resilient water supply and climate-resilient sanitation, GCF considers that additional objectives (to traditional WASH) must be added. These new objectives refer to elements of water supply and sanitation that are sensitive to climate change and trigger climate adaptation efforts:

- **To ensure water supply and sanitation infrastructure, services and behaviours are sustainable, safe and resilient to climate-related risks.** This goes together with the sustainable use, protection and conjunctive management of surface and groundwater resources, and resilient wastewater management. Typical decision metrics include reliability of services, storage in reservoirs, frequency of flooded infrastructure, frequency of non-functioning river intakes due to low flow, water quality parameters, etc.

- **To ensure that resilient water supply and sanitation programmes contribute to building community resilience to help them adapt to the impacts of climate change**. To achieve this, attention is needed first to those communities and groups that are disproportionately vulnerable to climate threats, especially women and girls, with lack of access to WASH playing a role in restricting their capacity to respond effectively. Further WASH contributions to community resilience can be achieved through capacity development focusing specifically on the position and needs of women and girls, and by fostering income generation, as well as food, energy and ecosystem resilience. Typical decision metrics include number of individuals, groups, communities, etc. with improved resilience and number of women participating in decision making (e.g. by applying "the participation ladder").

By engaging with GCF accredited entities and other institutions, GCF aims to contribute towards ensuring that communities most vulnerable to the impacts of climate change will have secure year-round access to safe drinking water and sanitation services. This will increase their resilience to climate-change related shocks and stresses.

Considering this, and in relation to potential **metrics towards "climate-resilient water supply and climate-resilient sanitation",** it is important to note that while the SDG indicator definitions above are consolidated and sector-wide agreed definitions, **even the indicators associated to the higher levels of service provision related to safely managed drinking water and safely managed sanitation do not directly address climate resilience. Therefore, the existing and agreed definitions and indicators cannot be, by themselves or without contextualization (e.g. by overlapping with high exposure to climate hazards), enough to track progress towards climate-resilient water supply and climate-resilient sanitation**. Indeed, the WASH community is currently undertaking two extensive consultations to develop a sector wide understanding of the elements that need to be in place to consider drinking water, sanitation and hygiene services as climate-resilient:

1. In November 2023 the **SWA Climate Task Team started a consultation to further define and agree on the elements that constitute a climate-resilient water supply and sanitation service**. The baseline is the draft definition that was included in the SWA and Partners submission to the Glasgow- Sharm El Sheik Work Programme on the Global Goal on Adaptation in March 2023. There, it was mentioned that climate resilient drinking water and sanitation services refer to services which are resilient to climate-related shocks and stresses and incorporate the following:
    - **Climate risk analysis:** identification of impacts of climate variability and change (including extreme weather events) in the performance of water, sanitation and hygiene systems and associated behaviours.
    - **Preventive measures:** infrastructure is designed to cope with and respond to climate-related shocks and stresses (e.g., elevated infrastructures in flood-prone areas, additional water storage capacities, additional treatment capacity etc.).
    - **Resilient management/service delivery models:** are financially sustainable and sufficiently robust and flexible to cope with crisis, consider different climatic scenarios and thresholds, and incorporate redundancy (e.g., ready to provide alternative service solutions) to ensure continuity of the services (and reestablishment of services following extreme events), and to prioritise a risk-based approach (for instance, applying water/sanitation safety planning).
    - **Environmental considerations:** (e.g., sustainable use, protection and conjunctive management of surface and groundwater resources in the context of climate change, resilient waste management) **and social considerations (**e.g., local and indigenous adaptation knowledge, differentiated impacts on women and girls, different populations) are observed and standards/regulations in place followed**.**

- **Contributions to community resilience:** are considered in the design of water, sanitation and hygiene interventions through a gender lens, capacity development and by fostering additional contributions such as (but not limited to) income generation, food, energy and ecosystem resilience.
- **Greenhouse gas emissions:** the impact of the service/system is considered in terms of greenhouse emissions and (when feasible) use renewable energy sources and reduce energy demands.

This on-going multi-stakeholder consultation aims to build consensus on a normative definition of climate-resilient drinking water, sanitation and hygiene services. It is expected to be completed in early 2024 and will directly inform a parallel on-going consultation on the development of indicators for national and global monitoring of climate resilient WASH services led by the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) and the UN Water/WHO Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS) as described below.

2. In December 2023 the UNICEF and WHO launched a request for proposals to enter into a contractual agreement with a successful bidder to carry out work to identify global indicators (the scope includes both process and outcome indicators for climate-resilient water supply, sanitation and hygiene (WASH) to be monitored by:
    a. WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene; and
    b. The UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS).

    This review has the following objectives and will ultimately inform the development of global indicators for climate resilient WASH to be monitored by GLAAS and JMP:

    1. To review and catalogue emerging definitions, tools and indicators for monitoring climate resilient WASH (short term)
    2. To identify and prioritize indicators for enhanced national and global monitoring of climate resilient WASH (medium term)
    3. To pilot priority indicators and to progressively integrate them into national WASH monitoring systems (long term)

    The review will involve inputs from principal groups:

    1) a secretariat led by WHO and UNICEF; 2) a research partner(s) to provide technical support for the process; 3) a working group(s) to provide technical feedback on key findings from each stage of the review; and 4) a broad set of stakeholders who will be engaged through consultations to solicit inputs to the review and provide feedback on the findings and recommendations. Over the course of two years (2024-2025), the working group(s) will meet five times in addition to online and email consultations.

It is proposed then, that the advances with the two consultations outlined above are well considered and inform the work of the two-year UAE – Belém work programme on indicators for measuring progress achieved towards climate-resilient water supply and climate-resilient sanitation.

Box 2. Monitoring climate resilient WASH through the UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS)

The current set of climate indicators in UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) 2024-25 cycle:

- A4. Are climate risk assessments undertaken for national WASH planning?
- A6. Content of WASH policies and plans/strategies (disaggregated by sub sector: urban sanitation, rural sanitation, urban water, rural water, WASH in schools, WASH in HCFs, other)
- A7. Is WASH addressed in other sector policies/plans (including Climate (e.g. NAP and NDCs)
- A9II. To what extend are there measures to improve and extend services to the following populations in national WASH policies and plans: a) Populations disproportionally affected by climate change (disaggregated by water, sanitation and hygiene and providing level or implementation) […]
- B1. Is the lead ministry responsible for climate resilience involved in Joint Sector Reviews (JSR)?
- B1. Is climate resilience covered in JSR?
- B4. To what extend have indicators been set and used to monitor climate resilient WASH (disaggregated by sub sector: urban sanitation, rural sanitation, urban water, rural water, WASH in schools, WASH in HCFs, other; and providing level of adoption)
- B4. Is there a definition of climate resilient WASH?
- B4. Please share any best practices and lessons learned from monitoring climate resilient WASH
- B7II. Tracking progress among vulnerable groups (including information on population disproportionally affected by climate change, disaggregated by water, sanitation and hygiene)
- D4II. Equity of vulnerable populations (including information on population disproportionally affected by climate change, disaggregated by water, sanitation and hygiene; and level of implementation)
- D8. Has the national government received climate finance for WASH activities.

Results from the GLAAS 2024 country survey will contribute to defining indicators for global monitoring of climate resilient WASH.

3.4 Towards access to safe and affordable potable water for all

In section 3.3 of this submission it has been described how **the Sustainable Development Agenda, more concretely target 6.1, already includes an ambitious target for "achieving universal and equitable access to safe and affordable drinking water"**. This is indeed a similar narrative to the one in the GGA water target, with two considerations:

- Because there are no adaptation or climate resilience considerations to this specific water reference of the GGA target it can be understood that the existing monitoring and tracking by the Joint Monitoring Programme can provide a strong basis to track access progress, **but not necessarily adaptation progress**.
- Since the GGA target recognizes the importance of advancing towards climate-resilient sanitation, it would be desirable if an urgent call is placed through the work on developing indicators so that the GGA also tracks advances towards the achievement of "equitable

sanitation and hygiene for all". This will help to ensure that GGA and SDG targets are coherent and mutually reinforcing.

An additional consideration, linking to what it has been described in section 3.3, and as reported by the IPCC AR6, is that "**Adaptation options that are feasible and effective to the 3.4 billion people living in rural areas around the world and who are especially vulnerable to climate change must include the provision of basic services, such as water and sanitation (high confidence)"[10].** For them, the provision and sustained management of resilient **water, sanitation and hygiene services reduces community vulnerability to climate change and is a critical component of adaptive capacity and resilience**.

Therefore, urgent efforts by countries, that could be tracked and monitored, are needed to map/identify and then prioritize the areas where high exposure to climate hazards overlap with insufficient access to drinking water (as well as to sanitation and hygiene) as indicated in the figure below (overlap of black and grey ellipses). This is particularly important in the least developed countries (e.g., those that have contributed least to climate change) as they overwhelmingly lag behind in terms of access to these essential services, and at the same time will have the most immediate impact and positive contribution towards global adaptation.

Figure 1. Prioritization of water supply and sanitation interventions for vulnerable populations highly exposed to climate hazards.

It must be noted that based on the most recent JMP global estimates, achieving the SDG drinking water target by 2030 will require a sixfold increase in current rates of progress, while progress towards the sanitation and hygiene targets will require increasing rates by fivefold and threefold, respectively. **Because these are now a double SDG and GGA target, and the JMP already monitors access, a proposed way to monitor adaptation progress is to track the amount of additional climate adaptation financing directed towards its achievement.**

[10] IPCC AR5 had already concluded that the most effective measures to address patterns of risks due to climate change and reduce near-term vulnerability are "programs that implement and improve basic public health measures such as provision of clean water and sanitation […]." (IPCC, 2014)

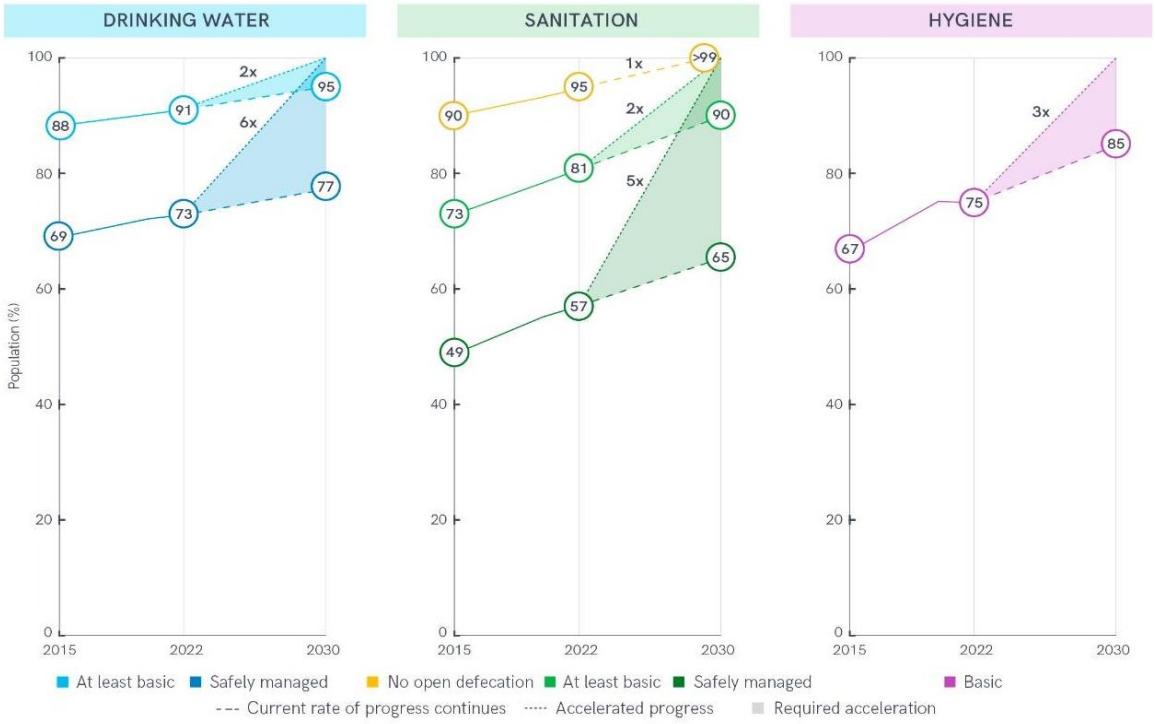

Figure 2. Global coverage of drinking water, sanitation and hygiene services, 2015–2022 (%), and acceleration required to reach universal coverage (>99%) by 2030[11]

Parties to the Paris Agreement can easily consult global, regional and national level of drinking water, sanitation and hygiene) service provision at the JMP website in a very simple way HERE. It should be noted as well that JMP also monitors access to drinking water, sanitation and hygiene in schools and in health care facilities.

3.5 Accelerating management, enhancement, restoration and conservation and the protection of inland water ecosystems

The paragraph 9d of the GGA Decision critically sets a thematic target on ecosystems and biodiversity where water is explicitly mentioned: "(by 2030 and progressively beyond) Reducing climate impacts on ecosystems and biodiversity, and accelerating the use of ecosystem-based adaptation and nature-based solutions, including through their management, enhancement, restoration and conservation and the protection of terrestrial, **inland water**, mountain, marine and coastal ecosystems".

The Convention on Biological Diversity (CBD) refers to **"inland waters"** as aquatic-influenced environments located within land boundaries. This includes those located in coastal areas, even where adjacent to marine environments. Therefore, inland waters include lakes, rivers, ponds, streams, groundwater, springs, cave waters, floodplains, as well as peatlands[12] (bogs, marshes and swamps), which are traditionally grouped as inland wetlands.

[11] Progress on household drinking water, sanitation and hygiene 2000–2022: special focus on gender. New York: United Nations Children's Fund (UNICEF) and World Health Organization (WHO), 2023

[12] UNEP defines 'Peatland' as a general term for land with a naturally accumulated layer of peat near the surface. Peatlands include both ecosystems that are actively accumulating peat and degraded peatlands that no longer accumulate but in contrast lose peat The International Peatland Society explains that peatlands are terrestrial wetland ecosystems in which waterlogged conditions prevent plant material from fully decomposing. Consequently, the production of organic matter exceeds its decomposition, which results in a net accumulation of peat

The CBD has adopted the Ramsar Convention's definition of **“wetland"** and takes a broad approach in determining the wetlands that come under its aegis. Under the text of the Convention (Article 1.1), wetlands are defined as: **"Areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres."**

The CBD notes that this definition includes all possible kinds of inland water body or ecosystem, or components thereof, including groundwater. The depth limit applies only to marine areas and not to inland water bodies.

The related concept of **“Inland water ecosystems”** includes also land. In that context, the CBD describes how from the ecological, hydrological, environmental and socio-economic perspective, all land is an integral part of an inland water ecosystem because fresh water (usually from rain) runs off it into rivers, lakes and wetlands. “Inland water habitat” also includes land that is influenced directly by aquatic habitat. For example, the vegetation near water bodies (in the riparian zone), even if never submerged, is influenced greatly by proximity to water. The clearest example of land-water interactions is with seasonally flooded areas, e.g., river floodplains, which may be dry or submerged depending on flood conditions.

To accelerate management, enhancement, restoration and conservation and the protection of inland water ecosystems it is important to consider the inter-linkages between water ecosystems and water and sanitation services. With climate change, inland water ecosystems are at higher risk of contamination from poor wastewater and fecal sludge management, especially during and after floods, storms and cyclones. Global estimates indicate almost half (48%) of wastewater is discharged to the environment without any treatment (Jones et al., 2021). Increased nutrients and pathogens increase algal growth, cause disease to biodiversity within such ecosystems and reduce their ability to recover from disturbances. Indeed, the CBD has reported how **inland water ecosystems are often extensively modified by humans, more so than marine or terrestrial systems, and are amongst the most threatened ecosystem types of all**. Physical alteration, habitat loss and degradation, water withdrawal, overexploitation, pollution and the introduction of invasive alien species are the main threats, according to the CDB, to these ecosystems and their associated biological resources.

Adaptation to reduce the vulnerability of ecosystems and their services to climate change has been addressed in several IPCC reports, with the fourth and fifth assessments reports (AR4 and AR5) recognising both “autonomous” adaptation and “human-assisted” adaptation to protect natural species and ecosystems. In AR5, **ecosystem-based adaptation**, adaptation for people, based on the **better protection, restoration and management of the natural environment**, was identified as an area of emerging opportunity. Applying the Ecosystem-based Adaptation approach has proven results on the ground, enhancing long-term adaptive capacity in communities, improving livelihoods, reducing climate risks and improving the health of a diverse range of ecosystems upon which we depend (UNEP, 2024). An Ecosystem-based approach is especially valuable for landscape scale impact including for transboundary basins where the entire basin is seen appropriately as one connected ecosystem and adaptation priorities are identified and selected accordingly. In this respect, applying ecosystem-based approaches, especially in transboundary basins can help avoiding mal-adaptation, enable maintaining of the ecosystem services within the basin as a whole and support transboundary climate-informed management and cooperation on global adaptation solutions (UNECE, 2009, 2015, UNDRR, 2018 and UNEP, 2024).

An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, highlighted in 2019 how conservation, ecosystem-based adaptation and related concepts were integrated throughout. Another IPCC special report on the impacts of global warming of 1.5 °C above pre-

industrial levels and related global greenhouse gas emission pathways (in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty) also had noted in 2018 the role of ecosystem-based adaptation. Between AR5 and the most recent IPCC assessment report (AR6), the scientific literature has expanded considerably, with growing interest in the concept of **nature-based solutions**.

Beyond important references to water ecosystems in its Water Security Guides, GCF also considers ecosystems and ecosystems services in a Sectoral Guide that focuses primarily on ecosystem-based management of terrestrial, freshwater, coastal, and marine ecosystems (including peatlands). The GCF vision for a **paradigm shift in ecosystems is to secure their resilience, functionality, and the maintenance of ecosystem services under conditions of climate change.** The guide explains that this can be achieved through large-scale protection, restoration, and adaptive management along two paradigm shifting investment pathways: a) ecosystem-based management of terrestrial and freshwater ecosystems; b) ecosystem-based coastal and marine zone management.

For the ecosystem-based management of terrestrial and freshwater ecosystems, GCF aims at maintaining or enhancing ecosystem function at scales sufficiently large to be sustainable and **facilitate adaptation to climate change**.

Table 2. Examples of adaptation benefits provided by Ecosystem-based Approaches (EbA) as highlighted by GCF Ecosystems Guide.

Examples of EbA practices	Examples of Benefits
Protect and restore riparian ecosystems	• Provide water storage • Increase bank stability (erosion control) • Regulate floods • Produce a physical barrier that restricts the flow of pollutants and sediments and prevents them from being washed into the aquatic ecosystem • Improve water quality through lower suspended sediment loads. • Provide shade, temperature control, wildlife refugia, and secure water flows to protect sensitive populations of flora and fauna, especially in arid regions
Restore and manage wetlands and coastal areas	• Sustain or improve water quality by trapping sediments, filtering pollutants, and absorbing nutrients • Increase biodiversity and improve connectivity between habitats. • Lower flood peaks downstream • Protect coasts against storms and inundation, especially through mangrove restoration • Reduce greenhouse gas emissions from wetlands, in particular peatlands • Protect coastal ecosystems from runoff and pollutants entering the ocean environment
Reconnect rivers to floodplains	• Increase natural storage capacity • Reduce flood risk • Restore wetlands • Enhance habitats for species, including migratory species • Enhance biodiversity included through ecosystem diversity

In relation to potential metrics for tracking progress towards "**accelerating management, enhancement, restoration and conservation and the protection of inland water ecosystems"** the Sustainable Development (SDG) Target 6.6 seeks to halt the degradation and

destruction of freshwater ecosystems, and to assist the recovery of those already degraded. The target includes ecosystems such as inland and coastal wetlands, rivers, lakes, reservoirs, and groundwater. Actions taken to protect and restore freshwater ecosystems readily contribute to the achievement of other SDG targets including on Climate - target 13.1 on strengthening resilience and adaptive capacity to climate-related hazards and natural disasters.

Progress towards target 6.6 is monitored through **indicator 6.6.1**. To inform decisions and actions that protect and restore freshwater ecosystems requires generating information on particular properties of ecosystems (area, quantity, and quality) to determine how much they are changing over time. For example, monitoring changes to the surface area of lakes, reservoirs, and wetlands; monitoring water quality in lakes, reservoirs, and rivers; and monitoring changes in the quantity of river flow and water held underground in aquifers.

UNEP is the custodian agency for SDG indicator 6.6.1. To help countries monitor water changes at basin level and nationally UNEP established an online data platform, the Freshwater Ecosystems Explorer. The Freshwater Explorer is a free and easy-to-use data platform. It provides accurate, up-to-date, high-resolution, geospatial data used to monitor SDG indicator 6.6.1 and depicts the extent to which freshwater ecosystems change over time in every country in the world. The Explorer has been developed to help decision-makers readily access and understand dynamic ecosystem changes within their country. The data contained on the site is nationally approved countries and contained nationally validated data for over 180 countries. In addition, UNEP leads the Global Peatlands Initiative, and as mandated by UNEA 4/16 Resolution established the current State of the World's Peatlands through the Global Peatlands Assessment and accompanying Summary for Policy makers - launched at UNFCCC COP27.

Further to that, the Kunming-Montreal Global Biodiversity Framework (GBF) builds on the Convention's previous Strategic Plans, and sets out 4 goals for 2050 and 23 targets for 2030. Among those, three targets make explicit references to "inland water", although those are not directly formulated in a context of addressing climate change:

- **Target 2:** Ensure that by 2030 at least 30 per cent of areas of degraded **inland water** are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.
- **Target 3**: Ensure and enable that by 2030 at least 30 per cent of **inland water** especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed […].
- **Target 11**: Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as the regulation of air, **water** and climate, soil health, pollination and reduction of disease risk […].

The Kunming-Montreal GBF is accompanied by a detailed **monitoring framework** **comprised of a set of agreed indicators for tracking progress towards the Goals and Targets of the Framework.** The monitoring framework includes **"headline indicators"** which are recommended for national, regional and global monitoring, and more detailed component and **"complementary indicators".** An ad hoc technical expert group (AHTEG), composed of 45 experts, 30 nominated by Parties and 15 by Observers was established to provide guidance on the operationalization of the monitoring framework for the period to the 2024 United Nations Biodiversity Conference (COP16), also known as the Conference of the Parties to the UN Convention on Biological Diversity (CBD), which is scheduled to take place from October 21 to November 1, 2024 in Cali, Colombia. At COP16, the world will take stock of the targets and commitments that have been set.

A contextualization to climate change of the targets and related indicators above can be a strong basis to track adaptation progress in the context of this water element of the GGA ecosystems and biodiversity target.

4. Initial views on the water dependency of all GGA thematic targets

Water is the connector between many thematic areas. This has been extensively discussed in the context of the sustainable development agenda, it has been argued by the GCF in its Water Security Guide, and applies now to the thematic targets of the GGA. In the case of GCF, it should be noted that the fund operates around eight result areas that have been targeted because of their potential to deliver a substantial impact on mitigation and adaptation in response to climate change. Those eight result areas correspond in a great manner with the seven GGA thematic targets and GCF highlights how water security has synergistic opportunities with all the other GCF result areas. Considering that, the following table aims at highlighting the water dependency for the achievement of all GGA thematic targets, beyond the targets, or part of targets (i.e. ecosystems) where water is explicitly mentioned in the GGA Decision (and that have been extensively discussed in the previous sections of this submission).

To support the achievement of many of the GGA thematic targets, the importance of implementing Integrated Water Resources Management (IWRM) (SDG 6.5.1), should be stressed. In the 2023 data collection round, countries identified one of the top priorities as strengthening institutional coordination mechanisms within and outside the water sector, to advance on multiple development objectives, across areas such as agriculture, human settlements, and poverty reduction.[13] The 6.5.1 survey contains question 2.1b on degree of implementation of coordination mechanisms between national government authorities representing different sectors on water resources policy, planning and management (0-100). The global average score for this question has increased from 63 (2017) to 66 (2020) to 69 (2023).

[13] UNEP (forthcoming, 2024). SDG 6.5.1 progress report.

Table 3. Cross-cutting GGA water and sanitation thematic considerations

GGA thematic target	Considerations for integrating water and sanitation in metrics across all GGA thematic areas
FOOD-AGRICULTURE: Attaining climate-resilient food and agricultural production and supply and distribution of food, as well as increasing sustainable and regenerative production and equitable access to adequate food and nutrition for all. **(Paragraph 9b)**	Climate change alters the frequency and intensity of rainfall, floods and droughts, causing significant impacts on agriculture and food production. Water-food-agriculture climate considerations by GCF include: climate smart agriculture through irrigation and efficient water-use including treated wastewater. Measures that substantially benefit climate adaptation, water security and greenhouse gas mitigation, such as the improved water management for rice production should be prioritized. IPCC AR6 highlights that agricultural water use is projected to increase globally due to cropland expansion and intensification and climate change induced changes in water requirements (high confidence). Parts of temperate drylands may experience increases in suitability for rainfed production based on mean climate conditions; however, risks to rain-fed agriculture increase globally because of increasing variability in precipitation regimes and changes in water availability (high confidence). Water-related impacts on economically valuable crops will increase regional economic risks (medium evidence, high agreement). Regions reliant on snowmelt for irrigation purposes will be affected by substantial reductions in water availability (high confidence). Depending on underlying assumptions and the constraints on water resources implemented in the global agricultural models, irrigation water requirements are projected to increase two- to three-fold by the end of the century. While the combined effects of population and land use change as well as irrigation expansion account for the significant part of the projected increases in irrigation water demand by the end of the century, around 14% of the increase is directly attributed to climate change. Globally, 11% of croplands are estimated to be vulnerable to projected climate driven water scarcity by 2050 (Fitton et al., 2019). Climate-resilient water resource management is a potentially powerful mechanism to achieve local, and possibly global, food security (encompassing food production, preparation distribution, consumption and waste).

	Global crop water consumption of green water resources (soil moisture) is projected to increase by about 8.5% by 2099 relative to 1971–2000 as a result of climate drivers, with additional smaller contributions by land use change (Huang et al., 2019) IPCC AR5 had already concluded that overall irrigation water demand would increase by 2080, while the vulnerability of rain-fed agriculture will further increase. Also, IPCC SR1.5 (2018) concluded that both the food and the water sectors would be negatively impacted by global warming with higher risks at 2°C than at 1.5°C, and these risks could coincide spatially and temporally, thus increasing hazards, exposures and vulnerabilities across populations and regions. While global crop models and estimates of yield impacts often focus on major staple crops relevant for global food security, crops of high economic value are projected to become increasingly water dependent. (Beringer et al., 2020). Following are related SDG, Sendai and Biodiversity Framework indicators and targets: • SDG target 2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality. • SDG indicator 2.4.1: Proportion of agricultural area under productive and sustainable agriculture • Sendai Framework C-2. Direct agricultural loss attributed to disasters. Agriculture is understood to include the crops, livestock, fisheries, apiculture, aquaculture and forest sectors as well as associated facilities and infrastructure. • Global Biodiversity Framework: TARGET 10: Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry
HEALTH: Attaining resilience against climate change related health impacts, promoting climate-resilient health services, and significantly reducing climate-related morbidity and mortality,	The influence of climate change on the human right to health is significant and varied. A primary impact is the spread of infectious diseases, many of which are waterborne and already present a major burden to vulnerable populations worldwide. (UN Water, 2019). Waterborne diseases such as cholera are highly sensitive to changes in temperature, precipitation and humidity (WHO, 2012). Indirectly, climate change can reduce agricultural productivity, negatively influence nutrition and increase the spread of food-borne illness. Agricultural use of inadequately treated wastewater can compromise food safety and increase the burden of disease. Increased incidences of extreme weather can intensify human exposure to water contaminated by agricultural run-off, flooded water and sewage treatment systems, and standing water (a habitat for toxic algal blooms and a breeding ground for disease vectors that increase malaria risk), while drought can decrease water quantity and quality (Christopher Portier and others, 2010). Drought also increases the entrainment of dust and fine particulate matter in the

particularly in the most vulnerable communities **(Paragraph 9c)**	air, causing a variety of human health impacts, particularly for children and the elderly. These impacts are felt over a range of timescales, requiring advanced planning and adaptation measures that can respond to short-term emergencies and longer-term stressors. Climate-resilient water and sanitation safety planning (WHO, 2017) are relevant risk-based management approaches for managing health risks associated with climate variability and change. The IPCC AR6 highlights that climate change is expected to compound existing vulnerabilities and increasing water-related health risks (medium evidence, high agreement). Therefore, additional research is required on disease-, country-, and population-specific risks due to future climate change impacts. The specific needs of women and girls need to be considered particularly as they are integral to the existing threats described in this section. Women and girls are more vulnerable as they menstruate, can be pregnant and often have a more fragile position in their societies, halting their access to healthcare in the first place - prioritising their needs is paramount to the human right to health for all.
INFRASTRUCTURE-HUMAN SETTLEMENTS: Increasing the resilience of infrastructure and human settlements to climate change impacts to ensure basic and continuous essential services for all, and minimizing climate-related impacts on infrastructure and human settlements **(Paragraph 9e)**	IPCC AR6 highlights that rapid population growth and urbanisation both linked to land use change and loss of natural ecosystems, ageing infrastructure and changes in water use are responsible for increasing the vulnerability of urban and peri-urban areas to extreme rainfall and drought, particularly in less developed economies with limited governance capacity (high confidence). In addition, modified stream flows due to climate change are projected to affect the amount and variability of water inflows to storage reservoirs that serve urban areas and may exacerbate challenges to reservoir capacity, such as sedimentation and poor water quality (high confidence). AR5 reported with medium confidence that climate change would impact residential water demand, supply and management. According to AR5, water utilities are also confronted by changes to the availability of supplies, water quality and saltwater intrusion into aquifers in coastal areas due to higher ambient and water temperatures (medium evidence, high agreement), altered streamflow patterns, drier conditions, increased storm runoff, sea level rise and more frequent forest wildfires in catchments. In nearly a third of the world's largest cities, water demand may exceed surface water availability by 2050, based on projections. Under all models, the global volume of domestic water withdrawal is projected to reach 700–1500 km3 yr–1 by 2050, indicating an increase of 50 to 250%, compared to the 2010 water use intensity (400–450 km3 yr–1). Increasing water demand by cities is already spurring competition between cities and agricultural users for water, which is expected to continue. As climate change poses a substantial challenge to urban water management, further refinement of urban climate models, downscaling and correction methods (e.g., Goore Bi et al., 2017; Jaramillo and Nazemi, 2018) is needed. Additionally, given

	that 90% of urban growth will occur in less developed regions, where urbanisation is largely unplanned (UN-Habitat, 2019), further research is needed to quantify the water-related risks of climate change and urbanisation on informal settlements. Urban water supply resiliency; urban water treatment; urban sanitation including decentralised wastewater management. Flood management, including sponge cities which acknowledge the critical role of wetlands and other ecosystems by using Ecosystem Based Management (EbM) within an integrated urban water approach. Circular economy to manage the water cycle, including urban farming. **Consideration for water- infrastructure- human settlements:** • Systems are in place to monitor, track, and assess the performance of critical infrastructure, such as transportation, energy, and water supply systems, to climate impacts. Data collected and lessons learned are integrated into future project design, disaster risk. • Adaptation of hydropower infrastructure could be considered to add to Infrastructure and Human Settlements (Nearly 40% of the global hydro fleet is over 40 years old, and upgrades and retrofits will account for almost 45% of capacity growth between now and 2030).
POVERTY ERADICATION-LIVELIHOODS: Substantially reducing the adverse effects of climate change on poverty eradication and livelihoods, in particular by promoting the use of adaptive social protection measures for all **(Paragraph 9f)**	Locally led climate-resilient water, sanitation and hygiene services effectively mitigate climate change adverse effects on people living in vulnerable contexts. By preventing water shortages, disease and malnutrition, WASH functions as an enabler for sustainable development, including poverty eradication, access to education and decent employment for women and men. Climate resilience is built via a systems approach where integrated resource management strategies are adopted and different sectors and communities collaborate. As climate change effects as well as existing governance structures are highly contextual, local stakeholders are best placed to assess climate change threats. With appropriate financial and capacity support, local stakeholders can become more self-sufficient in managing and developing resilience systems. This, in turn, provides work opportunities and overall stronger protection of livelihoods. SDG 1, which aims to eliminate poverty in all its forms and includes the target 1.4.1 for universal access to basic services including basic drinking water, sanitation and hygiene.
CULTURAL HERITAGE:	IPCC AR5 already found that climate change will threaten cultural practices and values, although the risks vary across societies and over time (medium evidence, high agreement). Furthermore, AR5 concluded that significant changes in the

Protecting cultural heritage from the impacts of climate-related risks by developing adaptive strategies for preserving cultural practices and heritage sites and by designing climate-resilient infrastructure, guided by traditional knowledge, Indigenous Peoples' knowledge and local knowledge systems **(Paragraph 9h)**	natural resource base on which many cultures depend would directly affect the cultural core, worldviews, cosmologies and symbols of indigenous cultures. IPCC SR1.5 concluded with high confidence that limiting global warming to 1.5°C, rather than 2°C, will strongly benefit terrestrial and wetland ecosystems and their services, including the cultural services provided by these ecosystems. IPCC AR6 expresses with high confidence that climate-driven hydrological changes to cultural water uses and culturally significant ecosystems and species are projected to pose risks to the physical well-being of Indigenous Peoples, local communities and traditional peoples. There is high confidence that the cultural water uses of Indigenous Peoples, local communities and traditional peoples are at risk of climate change-related hydrological change. Climate-driven variations in streamflow, land sinking/subsidence, saltwater intrusion and projected increases in water temperature will exacerbate declines of culturally important species and lead to variations or depletion of culturally important places and subsistence practices. For example, In Australia, Yuibera and Koinmerburra Traditional Owners fear the saltwater inundation of culturally significant sites and waterholes, while the flooding of culturally significant wetlands will negatively affect the Lumbee Tribe (USA). Moreover, changes in the carrying capacity of ice, snow quality and formation will probably increase the physical risks to Saami practising reindeer herding. IPCC AR6 concludes that further research is necessary to assess the extent and nature of climate-driven risks to cultural water uses in the context of broader socioeconomic, cultural and political challenges facing diverse Indigenous Peoples and local and traditional communities. In addition, given the significance of Indigenous knowledge and local knowledge to adaptive capacity and community-led adaptation, the potential risks of climate-related hydrological changes to diverse cultural water uses warrants closer study.

5. Initial water and sanitation views on the four GGA adaptation cycle targets

In a graphic way the following table aims at describing water and sanitation considerations against the 4 GGA dimensional targets of the iterative adaptation policy cycle (as per paragraph 10 of the Glasgow–Sharm el-Sheikh work programme).

Table 4. Water and sanitation considerations across the GGA adaptation policy cycle targets

GGA thematic target	Water and sanitation considerations across the iterative adaptation cycle
Impact, vulnerability and risk assessment: by 2030 all Parties have conducted up-to-date assessments of climate hazards, climate change impacts and exposure to risks and vulnerabilities and have used the outcomes of these assessments to inform their formulation of national adaptation plans, policy instruments, and planning processes and/or strategies, and by 2027 all Parties have established multi-hazard early warning systems, climate information services for risk reduction and systematic observation to support improved climate-related data, information and services **(Paragraph 10a)**	IPCC AR6 highlights that observed sectoral water-related impacts have been documented across world regions and climate change is projected to further exacerbate many of these risks. Risks manifest as a consequence of the interplay of human and natural vulnerability, **sector specific exposure as well as the climate hazard as a driver of climate change**. • The **Climate Risk Informed Decision Analysis (CRIDA) methodology**, developed by UNESCO, is a five-step process that adopts a participatory, bottom-up approach to identify water security risks related to hydro-climatic events, and is sensitive to the water vulnerabilities of indigenous populations and is guided by a gender perspective. Based on the role of groundwater, and its proper assessment and management, as key for adaptation, the CRIDA methodology also addresses groundwater and its integration other water sources ("conjunctive water management") within its risk analysis approach. • The **risk assessments methodology for water supply and sanitation**, developed by the Global Water Partnership and UNICEF guides the facilitation of national and subnational workshops and sets out an approach for conducting risk assessments for water supply and sanitation, providing evidence to support the prioritisation of risks requiring action: It covers risks across a wide range of hazard groups that affect the WASH sector, as well as climate related risks in more detail: It focuses primarily on rural services encompassing small-scale and community systems; however, the approach can be applied to both rural and urban settings. • Guidance on Water and Adaptation to Climate Change developed by UNECE focuses on the transboundary approach. Based on the concept of integrated water resources management, the Guidance provides advice to decision makers and water managers on how to assess impacts of climate

	change on water quantity and quality, how to perform risk assessment, including health risk assessment, how to gauge vulnerability, and how to design and implement appropriate adaptation strategies.
Planning: by 2030 all Parties have in place country-driven, gender-responsive, participatory and fully transparent national adaptation plans, policy instruments, and planning processes and/or strategies, covering, as appropriate, ecosystems, sectors, people and vulnerable communities, and have mainstreamed adaptation in all relevant strategies and plans **(Paragraph 10b)**	• It is critical that through guidance for implementation of actions to achieve the Global Goal on Adaptation, that countries are developing action that enables resilience. Paragraph 46 of the COP28 GGA decision references the need for "transformational" adaptation: "Requests the Secretariat to undertake work to examine how transformational adaptation is defined and understood at different spatial scales and sectors, and how progress in planning and implementing transformational adaptation approaches might be assessed at the global level." • The IPCC definition of resilience is: 'The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions. (IPCC, 2022).' • Water resilience emphasizes integrated human and natural systems to adapt and respond to realized and potential shifts in eco-hydrological systems, including the ability to reorganize and shift goals, indicators, and strategies in response to and in advance of systemic changes that support the integrity, health, and prosperity of those systems for future generations. • The **Water Tracker questionnaire** developed by the Alliance for Global Water Adaptation (AGWA) with IWMI as one of the supporting partners alongside Arup and Deltares, guides climate planners and policymakers to systematically evaluate both the explicit and implicit ways in which water is included in a country's national climate plans and planning processes. This includes exploring the synergies and trade-offs between multiple water-using sectors. • The Global Water Partnership has developed with UNFCCC A **NAP water supplement to the NAP technical guidelines**. The NAP water supplement is designed for countries to use as they prepare their NAPs, and contains examples of actions that countries, regional institutions, and development banks have taken on water-related adaptation. • The **water, sanitation and hygiene Bottleneck Analysis Tool (WASH BAT)** is a valuable resource developed jointly by UNICEF and the World Bank. The primary objective of WASHBAT is to assess the enabling environment for Water, Sanitation, and Hygiene (WASH) delivery. WASHBAT enables

	stakeholders to define targeted activities aimed at addressing the root causes of these bottlenecks. Recently, a new version of the WASHBAT Country Implementation Guide was introduced, incorporating over 10 years of implementation experience across several countries. This updated version includes a new module specifically designed to support the implementation of Risk-Informed WASHBATs, which play a crucial role in adapting to climate shifts and ensuring resilient WASH services. • The **SDG 6.5.1 survey** includes question 1.1c on degree of implementation of national integrated water resources management (IWRM) plans, (0-100), which includes a free text field covering aspects such as the extent to which water and climate plans/policies/strategies are coordinated. E.g. is water included in climate adaptation/mitigation plans, and climate considerations included in water management plans?. • **Sectoral NAPs / Case studies:** ▪ In Zambia, the country has taken a comprehensive approach to address climate adaptation. The first phase will enable long term strategic planning and coordination of adaptation. The second phase will be a water focused NAP that recognizes water as an essential connector to all sectors. The Water NAP will serve as an important pathway for building resilience and strengthen synergies between health and agriculture. • The Uganda government work on the formulation, implementation, monitoring and evaluation of the NAP is led by the Ministry of Water and Environment (MoWE), with the engagement of all other national actors and stakeholders through multi-stakeholder working teams and committees. However, as climate change adaptation is a need across different sectors, separate sectoral NAPs are considered necessary to guide the different actions required by each sector. In Uganda, so far, a sectoral NAP has only been prepared by the agriculture sector. MoWE is working now to develop a NAP for Water, Sanitation, and hygiene (WASH) to guide adaptation actions for the water and environment sector in Uganda.
Implementation: by 2030 all Parties have progressed in implementing their national adaptation plans, policies and strategies and, as a result, have reduced the social and economic impacts of the key climate hazards identified	▪ UNEP's "Adaptation Gap Report (AGR) 2023: Underfinanced. Underprepared" captures, at the global level the gap in financing adaptation. The AGR 2023 indicated that despite the clear signs of accelerating climate risks and impacts worldwide, the adaptation finance gap is widening and stands between US$194 billion and US$366 billion per year. Adaptation finance needs are 10–18 times as great as current international public adaptation finance flows – at least 50 per cent higher than previously estimated. So far, only a total of 52 countries have provided a breakdown of adaptation finance needs by sector (for at least three sectors). **Water, agriculture and infrastructure are the priority sectors identified in**

(Paragraph 10c)	**adaptation finance needs across regions**, though the priorities vary. Unfortunately, current analysis from the AGR 2023 finds that neither the goal of doubling 2019 international finance flows to developing countries by 2025 nor a possible new collective quantified goal for 2030 will significantly close the adaptation finance gap on their own. Therefore, the UNEP report identifies key ways to increase finance in order to deliver adaptation action including: domestic expenditure; international finance; private sector; remittance; increasing and tailoring finance to small and medium enterprises; reform of the global financial architecture. Putting in place metrics that track spending alongside sector-wide and multi-sector adaptation measures is needed. ▪ Close to $7 trillion is invested globally each year in activities that have a direct negative impact on nature from both public and private sector sources - equivalent to roughly 7 per cent of global Gross Domestic Product (GDP) - according to the 2023 State of Finance for Nature report by the UN Environment Programme (UNEP) and partners. ▪ UNEP's Global Adaptation Network and its Global EbA Fund (https://globalebafund.org/) is helping to support innovative approaches to Ecosystem-based Adaptation (EbA) for climate change. It aims to overcome barriers to upscaling EbA by catalysing innovative and inclusive initiatives. The Fund fills resourcing and knowledge gaps with a thematic focus on innovation, encouraging creative solutions and partnerships within and beyond the traditional EbA community. By supporting catalytic interventions, it addresses research gaps, pilots innovative EbA approaches, engages in strategic policy mainstreaming, and incentivizes innovative finance mechanisms and private sector investment in EbA. ▪ The SDG 6.5.1 survey includes question 1.1c on degree of implementation of national integrated water resources management (IWRM) plans, (0-100), which includes a free text field exploring the water-climate links in plans etc. (see above). This question could be modified to support the GGA indicator framework. ▪ The SDG 6.5.1 survey includes question 4.1 b on degree of implementation of national budget for IWRM elements (0-100), which includes a free text field covering aspects such as the degree to which financing for water and climate activities is coordinated and climate-related funding and financing instruments are integrated into financing for water resources management. This question could be modified to support the GGA indicator framework.

	▪ The Implementation Guide for Addressing Water-Related Disasters and Transboundary Cooperation developed by a multidisciplinary drafting group in collaboration with UNDRR to support implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 and provides practical and evidence-based advice on integrating disaster risk management with water management and climate change adaptation.
Monitoring, evaluation and learning: by 2030 all Parties have designed, established and operationalized a system for monitoring, evaluation and learning for their national adaptation efforts and have built the required institutional capacity to fully implement the system. **(Paragraph 10d)**	▪ See section 6 below on **lessons learnt from the UN-Water SDG6 Integrated Monitoring Initiative** ▪ In 2024, the Alliance for Global Water Adaptation (AGWA) in collaboration with FCDO and an expert network of expert reviewers, has produced an assessment of current water resilience adjacent indicators and recommendations for ways forward to measure, monitor and plan for water-resilience. It looked at traditional (e.g current) systems for Risk and Vulnerability Assessments, Adaptive Capacity; Finance and Funding; Social and Economic Indicators; Ecosystem Integrity; Infrastructure Resilience; Climate Monitoring and Early Warning Systems; Governance and Policy; Community and Stakeholder Engagement; Health and Wellbeing; Long-Term Planning – and then proposed a series of 37 resilience-oriented indicators aligned with these , with actions to initiate them on a 1 year horizon and outcomes on a 5 year horizon.

6. Lessons learnt from the UN-Water SDG6 Integrated Monitoring Initiative for SDG 6

In 2015, the Inter-Agency and Expert Group on SDG Indicators (IAEG) identified custodian agencies for each of the SDG global indicators agreed by UN Member States. Custodian agencies are expected to maintain global databases, lead methodological work and develop data standards, contribute to statistical capacity building, establish mechanisms to compile and verify national data, and provide internationally comparable data to the United Nations Statistical Division for inclusion in the SDG global database and annual SDG progress report.

Through the UN-Water Integrated Monitoring Initiative for SDG 6 (IMI-SDG6), the United Nations seeks to support countries in monitoring water- and sanitation-related issues within the framework of the 2030 Agenda for Sustainable Development, and in compiling country data to report on global progress towards SDG 6. IMI-SDG6 brings together the eight UN organizations[14] that are formally mandated to compile country data on the eleven SDG 6 global indicators, and seeks to integrate and strengthen existing monitoring mechanisms. This enables synergies across UN organizations, leading to more efficient outreach and a reduced reporting burden on countries. At the national level, IMI-SDG6 promotes coordination and collaboration across sectors in the collection, analysis and use of data for national and global reporting, and supports related capacity development.

The overarching goal of IMI-SDG6 is to accelerate the achievement of SDG 6, by increasing the availability of high-quality data for evidence-based policy-making, regulations, planning and investments at all levels. Credible data also provide stronger accountability and political commitment. Water and sanitation monitoring involves a wide range of stakeholders, across sectors and levels of government, and by bringing them and their datasets together, more efficient use of monitoring resources as well as more holistic policies and integrated resources management will follow.

IMI-SDG6 has existed since the establishment of the 2030 Agenda in 2015 and a number of key lessons on developing and implementing the global SDG 6 indicators may be relevant to eventual metrics of the Global Goal on Adaption water thematic indicators. Some relevant lessons are summarized below according to three broad headings.

5.1.1 Lessons on creating meaningful and useful metrics

The IAEG mandated UN custodian agencies to lead the **development of internationally comparable indicators and standardised methodologies** for a set of global indicators that can be monitored and reported by UN Member States on a regular basis. Having such a 'common denominator' for each indicator, under the IAEG auspices, enabled global comparisons, observations of temporal and geographic trends, increased levels of national buy-in, and economies of scale for technical outreach and support. These global measures also permitted the identification and examination of success stories, as demonstrated in the series of UN-Water SDG 6 Country Acceleration Case Studies. It is also important to note that the SDG 6 custodian agencies made deliberate efforts to ensure that the indicators were as simple, clear, and broadly-relevant as possible, while integrating feedback from the IAEG.

To ensure balanced and robust indicator methodologies, each custodian agency convened **Indicator Working Groups** of experts drawn from the UN as well as from other organisations, academia, and civil society. These teams met regularly during the 2012-2016 period overseeing the development and testing of each SDG 6 global indicator. Although the working groups functioned independently, deliberate steps were taken for peer review across groups, of mapping

[14] IMI-SDG6 partner agencies include World Health Organization (WHO), United Nations Children's Fund (UNICEF), United Nations Settlement Programme (UN-Habitat), United Nations Environment Programme (UNEP), Food and Agriculture Organization of the United Nations (FAO), United Nations Economic Commission for Europe (UNECE), United Nations Educational, Scientific and Cultural Organization (UNESCO), World Meteorological Organization (WMO).

of commonalities and common data sources, and generally encouraging cross-fertilisation across indicators.

A central part of the indicator development process was the **joint testing of the draft indicator methodologies** in five regionally-selected countries during 2016. These countries comprised Jordan, Netherlands, Peru, Senegal, and Uganda. In each of these countries the draft methodologies were reviewed by groups of stakeholders, data availability was assessed, and some new data collection was undertaken. In addition to the pilot testing, a broad Desk Review of the methodologies was undertaken by experts across the world. The feedback received was then used to revise and strengthen the draft methodologies into the version used in the SDG 6 global baseline reports published in 2017-18.

It should also be noted that IMI-SDG6 is currently developing methods for **the contextualisation of gender** within SDG 6 following a process similar to that followed for the global SDG 6 indicators in 2015-2016. This process is proving to be similarly efficient.

5.1.2 Lessons on building capacity

The global scope of SDG 6 monitoring requires liaison with all 193 UN Member States for the monitoring, reporting, and validation of each of the global indicators. The foundation of this interaction is a **network of focal points in each country**, including technical focal points (TPFs) responsible for one of more indicators and overall focal points (OFPs) who are tasked with ensuring synergy, communication, and collaboration across the TFPs, and also with encouraging links with national policy processes and coordination across sectors. There are currently more than 2000 focal points for SDG 6 monitoring globally.

The TFPs and OPFs are also the entry point for **capacity development and technical support** provided by IMI-SDG6 at the country level. This support is a very important part of the IMI-SDG6 workplan, and types of support vary from intensive direct support to individual countries, to regional and global trainings and exchanges, written guidance and tools, online training modules, helpdesks, and communities of practice. Such support lowers the bar for reporting and strengthens long-term sustainability.

The process of rolling out new global indicators can be a lengthy one that should not be taken lightly. **It is important to have realistic expectations** of the time for new indicators, definitions and methods to be taken up by national statistical systems. Indeed, halfway through the SDG period countries have made a lot of progress on understanding the new indicators, but there are many partners who have not yet adopted them.

5.1.3 Lessons on minimising the burden of reporting

During the process of developing the indicator methodologies by the Indicator Working Groups, a review of existing national, regional, and global monitoring processes was undertaken, with the aim of **maximising the use of existing processes and datasets** and to minimise the creation of completely novel metrics. Wherever possible information is drawn from existing national data sources including household surveys, censuses, and administrative, regulatory and financial databases. Where appropriate, global datasets were employed, for example earth observation for indicator 6.6.1 (freshwater ecosystems), environmental statistics for 6.3.1 (wastewater treatment) and OECD databases for 6.a. (official development assistance). This reduces the need for countries to generate their own data. These data of course are still subject to the usual bilateral validation processes.

The TPFs in each country are responsible to sending data for their respective indicators to the relevant custodian agencies, who then engage in a **bilateral discussion to validate the data** and ensure quality and comparability across countries. In addition to quality control, this process is a form of feedback and capacity building and serves to demonstrate the UN's commitment to using the data.

While to date each of the custodian agencies for SDG global indicators utilises their own reporting templates, efforts have been made to **streamline communications from the UN to**

countries by following a coordinated launch campaign for each global data collection exercise (global ‘data drives’), clear common deadlines, and coordination of outreach and helpdesk support across indicators. This is intended to simplify the messaging around the reporting process and to reduce possible overlap and confusion. Initial communications to countries are made to the OFPs, and subsequent follow up with TFPs include the OPFs in copy to clarify processes within each country.

Finally, all of the above outreach, support, and capacity building is **coordinated with other regional and global processes** to maximise efficiency and to minimize overlap. Such complementary processes include the African Ministers’ Council on Water (AMCOW) Water and Sanitation Sector Monitoring and Reporting System (WASSMO), the UNEP/GWP IWRM Support Programme, the UN-Water Capacity Development Initiative, National Water Roadmaps, and others.

REFERENCES

- Adaptation Fund, 2022, Transboundary Approaches to Climate Adaptation: Lessons Learned from the Adaptation Fund's Regional Projects and Programmes, https://www.adaptation-fund.org/wp-content/uploads/2022/04/Transboundary-Adaptation-final-April-2022.pdf
- Climate Change 2014: Impacts, Adaptation, and Vulnerability Part A: Global and Sectoral Aspects Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. 2014.
- Caretta, M.A., A. Mukherji, M. Arfanuzzaman, R.A. Betts, A. Gelfan, Y. Hirabayashi, T.K. Lissner, J. Liu, E. Lopez Gunn, R. Morgan, S. Mwanga, and S. Supratid, 2022: Water. In: Climate Change 2022: Impacts, Adaptation and Vulnerability.Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Portner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, S. Loschke,V. Moller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 551–712, doi:10.1017/9781009325844.006.
- IPCC, 2019: Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.- O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)]. https://doi.org/10.1017/9781009157988.001
- IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-24. https://doi.org/10.1017/9781009157940.001.
- Beringer, T., et al., 2020: First process-based simulations of climate change impacts on global tea production indicate large effects in the World's major producer countries. Environ. Res. Lett., **15**(3), 34023, doi:10.1088/1748-9326/ab649b.
- Milly, P. C. D., Dunne, K. A. and Vecchia, A. V. 2005. Global pattern of trends in streamflow and water availability in a changing climate. Nature, Vol. 438, No. 7066, pp. 347–350. doi.org/10.1038/nature04312.
- Fitton, N., et al., 2019: The vulnerabilities of agricultural land and food production to future water scarcity. Glob. Environ. Chang., **58**, 101944, doi:10.1016/j.gloenvcha.2019.101944.
- Huang, Z., et al., 2019: Global agricultural green and blue water consumption under future climate and land use changes. J. Hydrol., **574**, 242–256, doi:10.1016/j.jhydrol.2019.04.046.
- The Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2019), WMO, 2021.
- 2021 State Of Climate Services Water. WMO 2021
- Mekonnen, M.M. and A.Y. Hoekstra, 2016: Four billion people facing severe water scarcity. Sci. Adv., 2(2), e1500323, doi:10.1126/sciadv.1500323.
- GCF. (2022). Water Security Sectoral Guide. Sectoral Guide Series. Yeonsu: Green Climate Fund.

- GCF. (2023). Technical Annex-Part 2: Applications of the Practical guidelines for designing water-climate resilient projects in IWRM, CR-WASH, and Drought and Flood Management. Sectoral Guide Series. Yeonsu: Green Climate Fund GCF Guide Ecosystems
- GCF. (2022). Ecosystem and Ecosystem Services Sectoral Guide. Sectoral Guide Series. Yeonsu: Green Climate Fund
- Williams, William David and Mann, Kenneth H. "inland water ecosystem". *Encyclopedia Britannica*, 8 Sep. 2022, https://www.britannica.com/science/inland-water-ecosystem. Accessed 1 March 2024.
- Wang, M., Bodirsky, B.L., Rijneveld, R. *et al.* A triple increase in global river basins with water scarcity due to future pollution. *Nat Commun* **15**, 880 (2024). https://doi.org/10.1038/s41467-024-44947-3
- EARLY WARNINGS FOR ALL The UN Global Early Warning Initiative for the Implementation of Climate Adaptation. Executive Action Plan 2023-2027. The Un Global Early Warning Initiative for the Implementation of Climate Adaptation.
- UNECE and UNDRR, Words into Action Guidelines Implementation Guide for Addressing Water-Related Disasters and Transboundary Cooperation (2018, https://www.unece.org/index.php?id=50093)
- UNECE and INBO, Progress report of the Global network of basins working on climate change as of 2023, https://unece.org/sites/default/files/2023-07/Global_network_overview_pilot%20projects_progress_May2023_ENGL_Final_0.pdf
- UNECE, Guidance on Water and Adaptation to Climate Change, 2009, https://unece.org/environment-policy/publications/guidance-water-and-adaptation-climate-change
- United Nations Economic Commission for Europe and United Nations Educational, Scientific and Cultural Organization, Progress on Transboundary Water Cooperation: Global Baseline for SDG Indicator 6.5.2 (United Nations and United Nations Educational, Scientific and Cultural Organization, Geneva and Paris, 2018).
- *UNECE, Water and Climate Change Adaptation in Transboundary Basins: Lessons Learned and Good Practices (2015, https://www.unece.org/index.php?id=39417)*
- UN-Water, Transboundary Waters: Sharing Benefits, Sharing Responsibilities (Geneva, 2008).
- World Bank, Financing Climate Change Adaptation in Transboundary Basins Preparing Bankable Projects (2019, available at http://documents.worldbank.org/curated/en/172091548959875335/Financing-Climate-Change-Adaptation-in-Transboundary-Basins-Preparing-Bankable-Projects)
- World Health Organization and World Meteorological Organization, Atlas on Health and Climate (Geneva, 2012).
- Christopher Portier and others, A Human Health Perspective on Climate Change: A Report Outlining the Research Needs on the Human Health Effects of Climate Change (Research Triangle Park, N.C., Environmental Health Perspectives/National Institute of Environmental Health Sciences, 2010).
- World Health Organization, Climate-resilient Water Safety Plans: Managing Health Risks Associated with Climate Variability and Change (Geneva, 2017).
- IWRM Data Portal (SDG 6.5.1 implementation) http://iwrmdataportal.unepdhi.org/
- UN Water, Climate Change and Water UN-Water Policy Brief (2019)