Progress on the level of water stress

Mid-term status of SDG Indicator 6.4.2 and acceleration needs, with special focus on food security

2024

United Nations | UN WATER

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Abbreviations

EFR	environmental flow requirement
ERWR	external renewable water resources
FIES	Food Insecurity Experience Scale
GEFIS	Global Environmental Flows Information System
IRWR	internal renewable water resources
NGO	non-governmental organizations
PoU	prevalence of undernourishment
RBD	river basin district
RRI	Rights and Resources Initiative
RWB	Rwanda Water Resources Board
SEI	Stockholm Environment Institute
SIDS	Small Island Developing States
TFWW	total freshwater withdrawn
TRWR	total renewable freshwater resources
UNSD	United Nations Statistics Division
WBL	Women, Business and the Law
WEAP	Water Evaluation and Planning System

FAO Foreword

QU Dongyu,
FAO Director-General

Water sustains every aspect of sustainable development, from food security to environmental sustainability and economic development. Addressing water stress is essential for achieving Sustainable Development Goal 6, ensuring that we manage this critical resource sustainably to meet current and future needs, while preserving the livelihoods of millions of people and the ecosystems on which they depend.

Water stress levels are increasing around the world as a result of world population growth, improved living standards, changes in dietary habits, and the intensifying impacts of the climate crisis. Agriculture is both a significant contributor to and a victim of rising water stress levels. If current agrifood systems continue unchanged, future scenarios predict persistent food insecurity, degradation of natural resources including water, and unsustainable economic development.

The Food and Agriculture Organization of the United Nations (FAO) is actively engaged in monitoring and addressing water stress worldwide. Water is fully integrated into the FAO Strategic Framework 2022-31. FAO provides technical assistance, capacity building and policy support to countries facing water stress to optimize water use in agrifood systems – the largest user of freshwater resources globally. Water is included within FAO's thematic strategies on Climate Change, on Science and Innovation, and in FAO's Conceptual Framework for Integrated Land and Water Resources Management, as well as in the work of its governing bodies.

Additionally, FAO collaborates with international partners to improve water governance, ensuring that water resources are managed equitably and sustainably. These efforts are important for building resilience and efficiency to water stress, ensuring food security and achieving the Sustainable Development Goals.

This progress report illustrates the collective efforts towards monitoring SDG 6.4.2 "Level of water stress: freshwater withdrawal as a proportion of available freshwater resources". It presents an in-depth analysis of current trends in levels of water stress, highlights successful strategies and best practices, and identifies areas where more focused efforts are required. The data and insights of this report show the collaborative efforts of FAO, through its AQUASTAT information system, and relevant national authorities of Members.

This report is also the result of the UN collaborative efforts within the Integrated Monitoring Initiative for SDG 6 coordinated by UN-Water, which ensures a coherent monitoring framework for water and sanitation by 2030. Such a coordinated framework helps countries to achieve progress through informed decision-making on water, based on harmonized, comprehensive, timely and accurate information.

Monitoring water stress enables a better understanding of the balance between the demand for and availability of freshwater resources in a country. By tracking water stress, policymakers and partners can identify areas where water management practices need improvement, allocate resources more efficiently, and implement strategies to mitigate the impacts of over-extraction.

I believe this report will serve both as a benchmark in monitoring progress towards achieving SDG 6.4, as well as to inform a strategic roadmap for the future.

By placing water stress at the forefront of international and national agendas, world leaders can tackle critical challenges of sustainable development such as the climate crisis, and peace and food security, all of which are closely linked to water availability. Prioritizing integrated water management is essential for addressing these interconnected challenges and ensuring a better future for all.

UN-Water Foreword

Alvaro Lario,
President of the International Fund for Agricultural Development (IFAD) and Chair of UN-Water

We stand at a critical juncture. At the midpoint of the United Nations 2030 Agenda for Sustainable Development, we risk failing to meet the promise of SDG 6 – to ensure the availability and sustainable management of water and sanitation for all.

The 2024 series of indicator reports, published by the UN-Water Integrated Monitoring Initiative for SDG 6 (IMI-SDG6), depict a crisis with profound repercussions for many other SDGs, particularly those related to poverty, food, health, education, gender equality, sustainability and environmental integrity.

Billions of people worldwide are still living without access to safely managed drinking water and sanitation services. Water pollution levels are alarmingly high. Inefficient water use practices are common. Water scarcity is a growing problem. Degradation of water-related ecosystems continues unabated. Governance and transboundary cooperation on water resources are too weak, and every continent suffers the impacts of inadequate investment in water and sanitation infrastructure.

Despite concerted efforts and global commitments, we are compelled to acknowledge that progress so far has been insufficient to meet all eight targets of SDG 6. In some regions and countries, for some indicators, progress is even reversing.

However, over the past year, the UN-Water family has come together to develop a response that aims to accelerate progress through a more holistic and integrated approach.

After the UN 2023 Water Conference, in response to the high ambitions set by Member States, UN-Water released the Blueprint for Acceleration: SDG 6 Synthesis Report on Water and Sanitation 2023, which identifies two crucial needs: for Member States to develop a UN political process for water and for the UN system to better unify its water-related efforts to support Member States.

On the first, Member States adopted a resolution that, among other things, established two future UN water conferences – one in 2026 and one in 2028.

On the second, the resolution requested of the UN Secretary-General to present a United Nations system-wide water and sanitation strategy in consultation with Member States. The Secretary-General looked to UN-Water, under my leadership, to assist with this.

The strategy will be presented in July 2024: the middle of a year that marks a pivotal moment in our collective journey towards achieving SDG 6. It is time to redouble our efforts, recalibrate our strategies, and mobilize resources to make good on our commitments to global society and the future of our planet.

We face unprecedented challenges, but we now have unprecedented tools and political momentum. The data and insight gathered by the IMI-SDG6 must guide our prioritization of efforts and investments to the areas of greatest need, ensuring no one is left behind.

Acknowledgments

The SDG 6.4.2 Progress Report was prepared with technical contributions from Riccardo Biancalani, Ghaieth Ben Hamouda, Michela Marinelli, and Lucie Chocholata of the FAO Land and Water Division. We extend our sincere gratitude to Marta Rica, FAO consultant, for her support in drafting the report.

The preparation of the report was led by Patricia Mejias-Moreno, AQUASTAT Coordinator under the overall guidance of Lifeng Li, Director, and Jippe Hoogeveen, Team Leader, Data and Water Resources Assessment in the Land and Water Division. The data presented in this report are the result of a collaborative effort between national institutions and the AQUASTAT program at FAO. We are deeply thankful to the national institutions. Their contributions have been key, and without them, this report would not have been possible.

The authors wish to acknowledge all the colleagues from the Integrated Monitoring Initiative for SDG 6 (IMI-SDG6) and its Strategic Advisory Board who provided valuable comments on the draft report, and the overall support provided by UN-Water's Senior Programme Managers.

We gratefully acknowledge the contributions of the following entities to the UN-Water Inter-Agency Trust Fund: the Austrian Development Agency, the German Federal Ministry for Economic Cooperation and Development, the European Commission, the Netherlands Ministry of Foreign Affairs, the Netherlands Ministry of Infrastructure and Water Management, the Swedish International Development Cooperation Agency and the Swiss Agency for Development and Cooperation.

This report was produced as part of a series of reports on SDG indicators 6.3.1, 6.3.2, 6.4.1, 6.4.2, 6.5.1, 6.5.2 and 6.6.1, coordinated by UN-Water through the Integrated Monitoring Initiative for SDG 6.

Presenting the UN-Water Integrated Monitoring Initiative for SDG 6

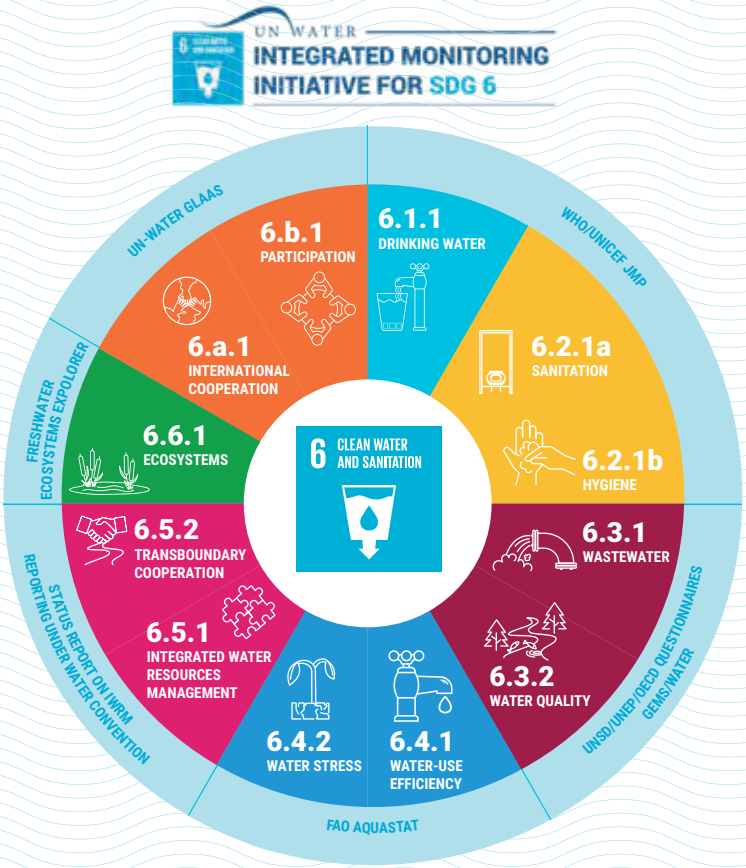
Through the UN-Water Integrated Monitoring Initiative for SDG 6 (IMI-SDG6), the United Nations seeks to support countries in monitoring water- and sanitation-related issues within the framework of the 2030 Agenda for Sustainable Development, and in compiling country data to report on global progress towards SDG 6.

IMI-SDG6 brings together the United Nations organizations that are formally mandated to compile country data on the SDG 6 global indicators, and builds on ongoing efforts such as the World Health Organization (WHO)/United Nations Children's Fund (UNICEF) Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP), the Global Environment Monitoring System for Freshwater (GEMS/Water), the Food and Agriculture Organization of the United Nations (FAO) Global Information System on Water and Agriculture (AQUASTAT) and the UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS).

This joint effort enables synergies to be created across United Nations organizations and methodologies and requests for data to be harmonized, leading to more efficient outreach and a reduced reporting burden. At the national level, IMI-SDG6 also promotes intersectoral collaboration and consolidation of existing capacities and data across organizations.

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 policymaking, regulations, planning and investments at all levels. More specifically, IMI-SDG6 aims to support countries to collect, analyse and report SDG 6 data, and to support policymakers and decision makers at all levels to use these data.

- Learn more about SDG 6 monitoring and reporting and the support available: http://www.sdg6monitoring.org
- Read the latest SDG 6 progress reports, for the whole goal and by indicator: https://www.unwater.org/publication_categories/sdg6-progress-reports/
- Explore the latest SDG 6 data at the global, regional and national levels: http://www.sdg6data.org



INDICATORS	CUSTODIANS
6.1.1 Proportion of population using safely managed drinking water services	WHO, UNICEF
6.2.1 Proportion of population using (a) safely managed sanitation services, and (b) a handwashing facility with soap and water	WHO, UNICEF
6.3.1 Proportion of domestic and industrial wastewater flows safely treated	WHO, UN-Habitat, UNSD
6.3.2 Proportion of bodies of water with good ambient water quality	UNEP
6.4.1 Change in water-use efficiency over time	FAO
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	FAO
6.5.1 Degree of integrated water resources management	UNEP
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	UNECE, UNESCO
6.6.1 Change in the extent of water-related ecosystems over time	UNEP, Ramsar
6.a.1 Amount of water and sanitation-related official development assistance that is part of a government-coordinated spending plan	WHO, OECD
6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	WHO, OECD

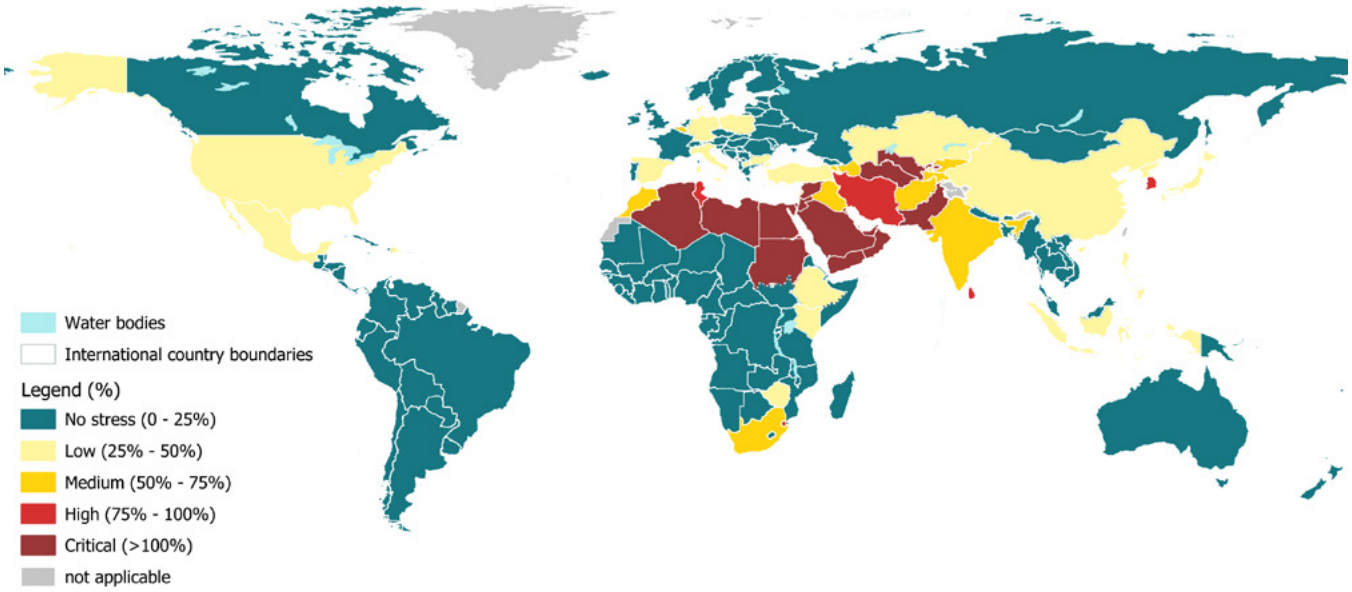
Executive summary

This report provides an updated analysis of the progress of Sustainable Development Goal (SDG) Indicator 6.4.2, which monitors water stress levels globally. It examines the pressure on renewable freshwater resources from various economic sectors, presents case studies disaggregating this indicator at river basin levels, and explores the nexus between water stress and food security, emphasizing gender-sensitive approaches to water stress challenges.

Water stress levels have increased by 2.8 percent globally since 2015, reaching 18.6 percent in 2021. Significant regional variations exist, with Southern and Central Asia, Northern Africa and Western Asia exhibiting high water stress levels.

Most regions have experienced rising water stress levels in recent years, with Western Asia and Northern Africa seeing a significant 12 percent increase since 2015, highlighting acute challenges exacerbated by climate change. Conversely, subregional decreases in water stress were observed in Europe, Central Asia and Eastern Asia.

Water stress levels by country



Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.

Source: FAO. 2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024. https://data.apps.fao.org/aquastat/?lang=en

Globally, agriculture emerges as the main user of water resources, accounting for 72 percent of total freshwater water withdrawals, followed by the industrial sector (15 percent), and the service sector (13 percent).

Approximately 10 percent of the global population lives in countries with high and critical water stress levels. In 2021, over 791 million people were affected by high water stress, up from 721 million in 2015.

Aggregating water stress values at global and regional levels masks significant disparities, stressing the need for disaggregation to better understand causes and impacts. Such disaggregation facilitates policy and decision makers to target interventions more effectively focusing on regions with high water stress and sectors with significant water use.

Women are disproportionately affected by water stress due to their roles and limited access to resources. Addressing water stress requires integrating gender perspectives into water management policies to ensure equitable access and control over water resources.

High water stress challenges agrifood systems, limiting irrigation and agricultural productivity, posing a threat to food security. In 2022, 900 million people faced severe food insecurity, with water stress exacerbating the situation in regions heavily reliant on agriculture.

If current agrifood systems continue unchanged, future scenarios predict persistent food insecurity, degradation of natural resources including water, and unsustainable economic growth (FAO, 2022). Effective policies and management options can transform agrifood systems sustainably, ensuring social equity and inclusivity in efforts to reduce water stress.

Effective action on water stress requires targeted efforts at all governance levels. National governments can develop integrated water management policies, invest in infrastructure and promote public awareness. Locally, communities should have access to water conservation techniques, such as rainwater harvesting and efficient irrigation. Regional cooperation is vital for managing shared water resources and mitigating conflicts. These combined efforts are crucial for sustainable water management and addressing the challenges of water stress.

Key messages

- SDG Indicator 6.4.2 reached a level of 18.6 percent in 2021. Since 2015, water stress levels have increased by 2.8 percent at the global level, indicating that freshwater withdrawals do not compromise the sustainability of the available freshwater resources at global scale.

- The global water stress level entails substantial regional variations. Particularly, Southern and Central Asia, as well as Northern Africa and Western Asia report a high level of water stress. This situation is particularly acute in the Northern African subregion, where critical water stress conditions reach critical levels.

- The increase in the level of water stress is particularly pronounced in Western Asia and Northern Africa, where in addition to already high levels of water stress, the indicator increased by nearly 12 percent since 2015.

- Globally, agriculture emerges as the main user of water resources, accounting for 72 percent of total freshwater water withdrawals in 2021. Following agriculture, the industrial sector used 15 percent, while the service sector accounted for 13 percent of the total withdrawals.

- In 2021, 119 countries experienced no stress levels (below 25 percent), 23 countries had low stress (between 25 and 50 percent) and 13 countries faced medium stress (between 50 and 75 percent). A total of 8 countries are confronting high levels of water stress (water stress exceeding 75 percent) and 17 countries are experiencing a critical water stress level (water stress over 100 percent), mainly concentrated in Northern Africa and Western Asia.

- Five countries with high water stressed levels have seen a decline in their stress levels since 2015 meaning that efforts are taken to reduce the vulnerability to water stress.

- On average, approximately 10 percent of the global population live in countries with high and critical water stress levels.

- The disaggregation of the indicator at different spatial and temporal scales is particularly important, and highly recommended wherever feasible. The spatial disaggregation enhances the indicator's relevance and utility for policymaking by providing more nuanced understanding of local variations and specific challenges.

- It is crucial to incorporate a gender perspective into SDG Indicator 6.4.2 through complementary analysis. This includes examining the accessibility of technologies or land and water tenure rights across different gender groups. Such an approach will help ensure that water management strategies to tackle water stress are equitable and inclusive.

- Water stress intensifies the vulnerability of agrifood systems, already impacted by conflict, climate extremes, and economic challenges, making it harder to provide nutritious, safe, and affordable diets for all.

- High water stress can significantly limit irrigation and consequently agricultural productivity, posing a serious threat to food security, in particular in arid and semi-arid countries.

- Mapping SDG 6.4.2 alongside SDG 2.1.2 (proportion of the population facing moderate food insecurity) highlights countries where water stress may hamper agrifood systems development. Of 69 food-insecure countries, 10 percent face critical or high water stress, while 77 percent experience no significant water stress, often due to low economic development and inadequate water infrastructure.

- One of the main challenges affecting the monitoring process of Indicator 6.4.2 pertains to the availability of accurate, comprehensive and up-to-date data. The global calculation of SDG Indicator 6.4.2 relies on data from 180 countries. Globally, over the past decade, 67 countries have not been reporting water stress data, with a significant portion of these countries being Small Island Developing States (SIDS).

Monitoring water stress under the 2030 Agenda

This report presents an updated analysis of the progress of the Sustainable Development Goal Indicator 6.4.2, which monitors the level of water stress. The report provides an estimation of the pressure placed on the world's renewable freshwater resource by the different economic sectors and includes several case studies that disaggregate this indicator at river basin level. Furthermore, the report explores the critical nexus between water stress and food security and underscores the importance of gender-sensitive approaches in addressing water stress challenges.

SDG Indicator 6.4.1 and Indicator 6.4.2, were specifically designed to monitor progress towards achieving SDG 6 Target 6.4 which aims to "by 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity". Target 6.4 focuses on critical issues related to water use and scarcity, with the overarching goal of ensuring adequate water resources for people, the economy and the environment. The Food and Agriculture Organization (FAO) is the custodian agency for these indicators, responsible for gathering date and computing the indicator in collaboration with national focal points to ensure accuracy and reliability of the indicators.

Box 1. The role of custodian agencies

Custodian agencies are in charge of compiling and verifying country data and metadata, and submitting the data, along with regional and global aggregates, to the United Nations Statistics Division (UNSD). The country data needs to be internationally comparable, and to this end, the agencies are responsible for the development of international standards and methodologies for monitoring, as well as encouraging countries to adopt them. They are also in charge of strengthening the national monitoring and reporting capacity process.

Agenda 2030 and SDG 6

The 2030 Agenda, encompassing 17 SDGs and their associated 169 targets, embodies the international community's commitment to eradicate poverty, hunger and achieve sustainable development in all three dimensions (social, economic and environmental) by 2030. The SDGs are designed with a holistic approach, emphasizing the interconnection of these goals as a core principle.

Advances in one goal often influences progress across others. For instance, access to clean water and sanitation (SDG 6) is essential for achieving several other goals. Improved water and sanitation facilities are crucial for improved health outcomes (SDG 3), as they reduce the risk of waterborne diseases and improve hygiene. Water is also crucial for food security (SDG 2), as agriculture accounts for the largest share of global water use. Adopting sustainable water management practices can enhance agricultural productivity and resilience to climate change. Moreover, water availability is intimately linked to the sustainable use of terrestrial ecosystems (SDG 15), and climate action (SDG 13). Healthy aquatic ecosystems (SDG 14) provide essential ecosystem services, such as water purification and conservation, flood regulation, biodiversity habitat and resilience against drought. Despite the critical importance of water in advancing the development agenda, water resources are increasingly threatened by pollution, overexploitation and climate change impacts.

Figure 1. Seventeen SDGs under the Agenda 2030

Source: United Nations, https://sdgs.un.org/goals

To effectively address the integrated nature of the SDGs, it is essential that governments adopt integrated and multisectoral approaches in policymaking, resource allocation and the implementation of development programmes. Furthermore, supported by custodian agencies, national governments are urged to develop robust data-collection mechanisms and performance indicators, to monitor the progress of each SDG and their dependencies over time. The SDG framework enables evidence-based decision-making, fosters accountability and promotes transparency in the implementation of sustainable development policies and programmes.

SDG 6 progress needs acceleration

The SDG 6 Synthesis Report 2018 on Water and Sanitation highlighted a concerning fact: the world is off-track to reach SDG 6 and its targets by 2030. To address this challenge the UN launched the SDG 6 Global Acceleration Framework in 2020 as part of the United Nations Secretary-General's Decade of Action on Water and Sustainable Development 2018–2028. The framework mobilizes UN agencies, governments, civil society and the private sector around five cross-cutting and interdependent accelerators.

- *Financing* – Optimized financing is essential to get resources behind country plans.
- *Data and information* – Data and information targets resources and measures progress.
- *Capacity development* – A better-skilled workforce improves service levels and increases job creation and retention in the water sector.
- *Innovation* – New, smart practices and technologies will improve water and sanitation resource management and service delivery.
- *Governance* – Collaboration across boundaries and sectors will make SDG 6of interest for everyone.

Figure 2. SDG 6 Global Acceleration Framework action cornerstones

Source: **UN-Water, 2020**

Furthermore, the UN Water Conference convened in New York from 22 to 24 March 2023, compiled new voluntary commitments and actions by governments and all stakeholders to address the global water crisis and accelerate action. Through these voluntary commitments, at small or large scale, sustained implementation and annual reviews, the agenda aims to drive transformative change and bring successful solutions to a global scale. Stakeholders including governments, the UN system, international financial institutions, civil society, the private sector and multi-stakeholder partnerships play vital roles in committing to action, implementing, financing and supporting the agenda's objectives (UN, 2022).
To date, there are approximately 840 commitments, of which approximately 25 percent are labelled as financial resources (UN, 2023). Water-related investments can yield significant economic benefits, and by acknowledging this, policymakers and stakeholders can prioritize sustainable water management strategies that promote inclusive growth and long-term prosperity.

What is water stress and why is it important?

Water stress is defined as the ratio of total freshwater withdrawn to the total renewable freshwater resources within a specific region, after considering environmental flow requirements (EFR). This metric quantifies the degree to which water use exceeds the sustainable replenishment of freshwater resources in a given area.

Monitoring water stress holds significant importance as it facilitates decision-making processes. Understanding the level of water stress allows water managers and policymakers to identify regions where water use is unsustainable and take appropriate measures to mitigate the problem. The identification of areas of high water stress allows for the implementation of measures to alleviate its impacts. This process can help prevent the social and economic problems that can arise from water scarcity, enable the development of strategies to ensure equitable access to water, foster social cohesion and economic stability. In the agricultural sector, monitoring water stress can lead to better irrigation practices and informed crop selection, which aligns with SDG Target 2.4, which focuses on sustainable agriculture.

Moreover, understanding water stress can help to strengthen a community's resilience and adaptive capacity to climate-related hazards and natural disasters like droughts, supporting SDG Target 13.1. In summary, monitoring water stress is a fundamental tool for sustainable water management and disaster preparedness.

The disaggregation of the indicator at different spatial and temporal scales is particularly important and highly recommended wherever feasible. The spatial disaggregation enhances the indicator's relevance and utility for policymaking by providing more nuanced understanding of local variations and specific challenges.

How to interpret the level of water stress?

The SDG Indicator 6.4.2 metric serves to quantify the extent to which water resources are being exploited to fulfil the water demand within a country. Ideally, this indicator should exhibit a downward trend, showing a reduction in water stress. However, countries with particularly low values of this indicator may find it necessary to increase their withdrawals to improve the availability and quality of water services, including irrigation and water, sanitation and hygiene. As such, an increase in the indicator's value, under these circumstances, represents a policy response to enhance water resource management and access.

A threshold of 25 percent has been set as the upper limit for what can be considered a comprehensive and unconditional water stress safety as assessed by Indicator 6.4.2. This implies that values falling below 25 percent can be considered safe under any circumstance (no stress). Values above 25 percent need detailed assessment and potential intervention as it implies varying degrees of water stress that could compromise water resources sustainability. Beyond 25 percent threshold of water stress, four classes have been established to indicate different levels of stress severity (Figure 3).

Figure 3. Threshold values for water stress results

This multilevel approach mitigates the substantial risk of penalizing the countries facing water scarcity and that are actively working to enhance water access for their population, thereby alleviating potential conflicts between achieving this indicator and those indicators aimed at monitoring water accessibility and availability, such as SDG 6.1.1 and 6.2.1. At the same time, the identification of a severity scale for higher values acknowledges the efforts undertaken by arid and semi-arid countries to reduce their water stress.

A withdrawal rate surpassing 75 percent of renewable water resources represents high water stress, while exceeding 100 percent is deemed critical. High water stress levels pose considerable environmental risks and can impede or even reverse economic and social development.

Capacity development for SDG Target 6.4

Capacity development represents one of the five accelerators of the SDG 6 Global Acceleration Framework, along with financing; data and information; innovation; and governance (Figure 2). Skilled stakeholders enhancing sustainable implementation of SDG 6 is crucial to actually deliver progress in SDG 6.4.2.

FAO supports countries in the collection, analysis and reporting of Target 6.4 indicators. Additionally, FAO provides support to policymakers in leveraging data to inform and enhance project development and policy formulation. Capacity-building initiatives led by FAO include the development of interactive e-learning courses, the elaboration of methodological guidelines for the computation of the indicators and their disaggregation. FAO also offers help desk support to respond to the queries from countries. Moreover, webinars and training workshops are organized, upon request from countries or regional organizations, to provide direct training to relevant staff on the process of data collection, indicator reporting, methodological aspects and decision support.

The capacity-building materials are aimed mainly at, but not limited to:

- water monitoring or water management professionals working in a ministry, government agency or relevant technical institution involved in the water resources monitoring process in the context of the SDGs;
- environmental statistics professionals working in a national statistical office or in a technical or scientific institution relevant to the monitoring of water resources and the evaluation of the respective indicators in the SDG framework;
- professionals in a water basin authority; and
- other professionals such as researchers and students of the water sector.

Box 2. Methodological resources for the 6.4.1 Indicator calculation

For further insights into the calculation methodology of SDG Indicator 6.4.2, please refer to:

Integrated Monitoring Initiative for SDG 6 (IMI-SDG 6) at FAO website

SDG Indicator 6.4.2 web page:
https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/642-water-stress/en

Supporting documents: SDG Indicator 6.4.2 indicator metadata + Step-by-step guidelines

SDG Indicator 6.4.2 e-learning course

Incorporating environmental flows into “water stress” Indicator 6.4.2. Available here

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Results and analysis: status and progress of SDG 6.4.2

Level of water stress – a global problem regionally differentiated

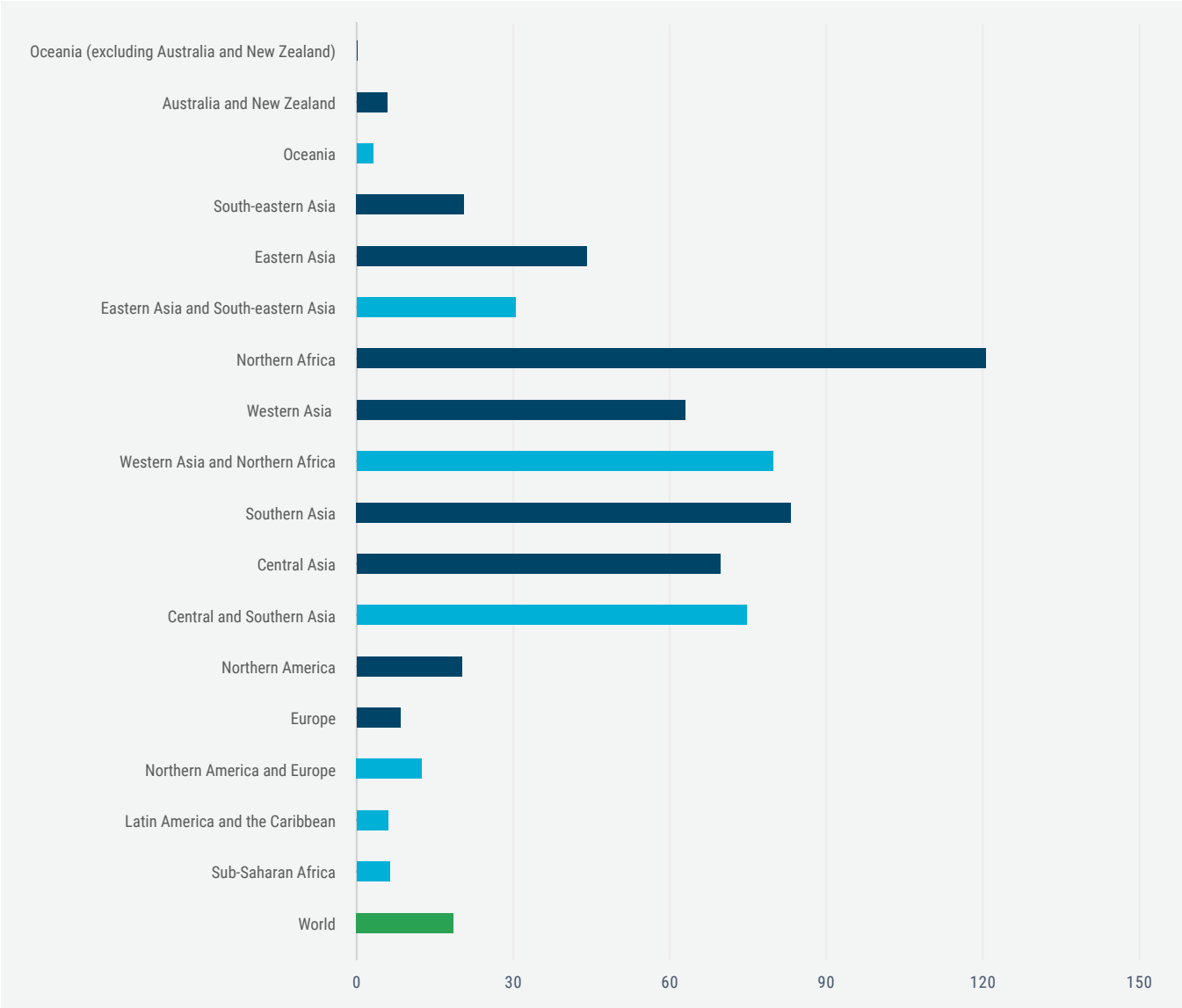
SDG Indicator 6.4.2 reached a level of 18.6 percent in 2021 (Figure 4). Since 2015, water stress levels have witnessed a 2.8 percent increase at the global level, which still indicates that at the global level, freshwater withdrawals do not compromise the sustainability of the available freshwater resources. Yet, this aggregate figure entails substantial regional variations. Particularly, Southern and Central Asia, as well as Northern Africa and Western Asia exhibit a high level of water stress. This situation is particularly acute in the Northern African subregion, where water stress conditions reach critical levels (Figure 5).

Figure 4. Global level of water stress (percent) from 2015 to 2021

Key message: Since 2015, water stress levels have increased by 2.8 percent at the global level reaching 18.6 percent in 2021.

FAO.2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024 https://data.apps.fao.org/aquastat/?lang=en

Figure 5. Water stress levels at SDG region (light blue) and subregional level (dark blue) in 2021

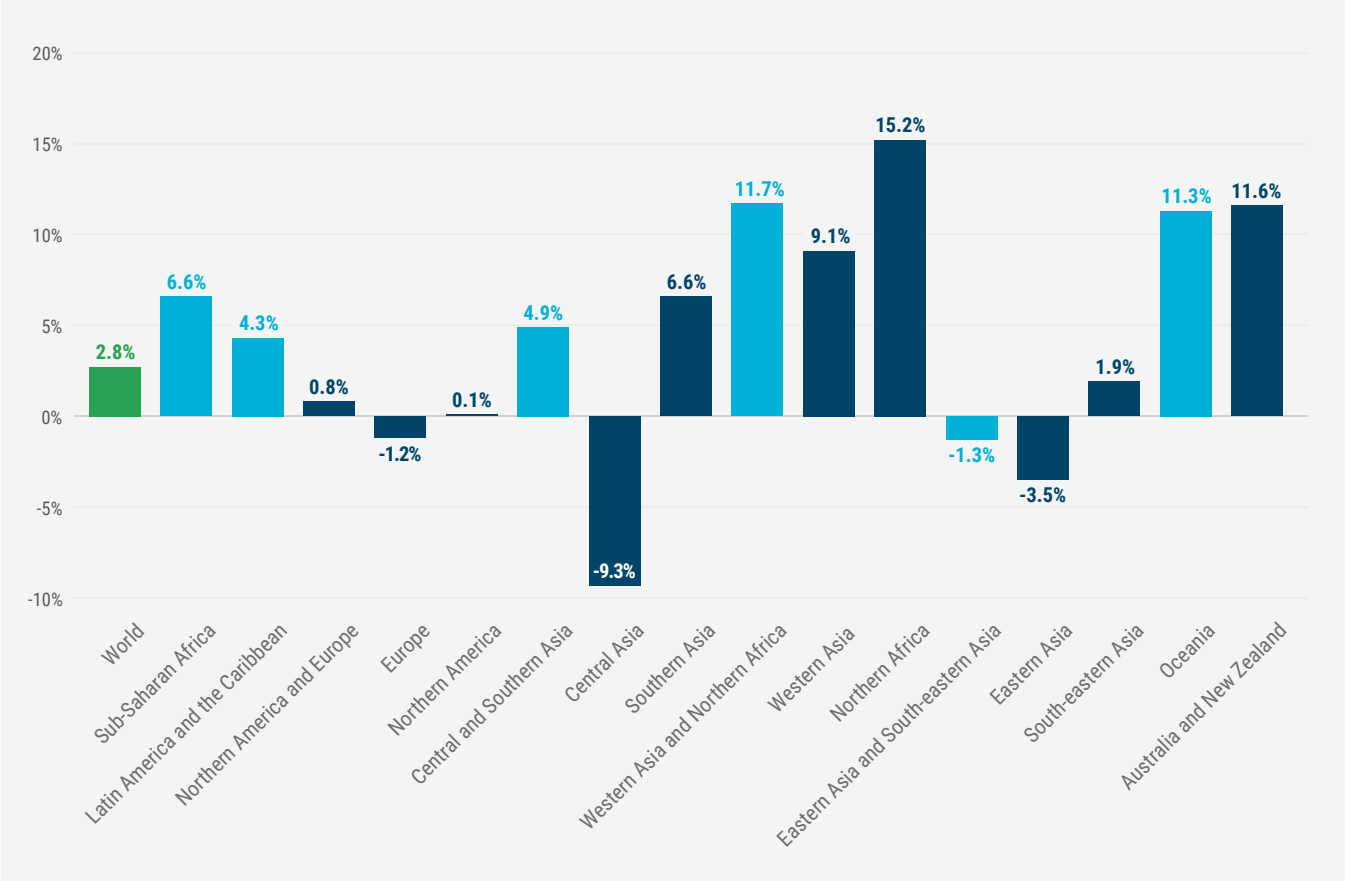


Key message: Water stress is particularly acute in the Northern Africa Region and Western Asia as well as Southern and Central Asia.

FAO.2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024 https://data.apps.fao.org/aquastat/?lang=en).

Most regions have witnessed a rise in water stress levels during the last few years, as shown in Figure 6. The trend is especially pronounced in Western Asia and Northern Africa, where in addition to already high levels of water stress, there has been a significant rise in the indicator value by nearly 12 percent since 2015. These increases underscore the acute challenges faced by those regions, which are compounded by the impacts of climate change, such as more frequent droughts and heatwaves. Conversely, decreases in the water stress values can be observed at the subregional level in Europe, Central Asia and Eastern Asia. To meet Target 6.4, the desired trend in the water stress levels should be a decline, particularly in areas where water stress is already high.

Figure 6. Percentage change in water stress level from 2015 to 2021 in SDG regions (light blue) and subregions (dark blue)



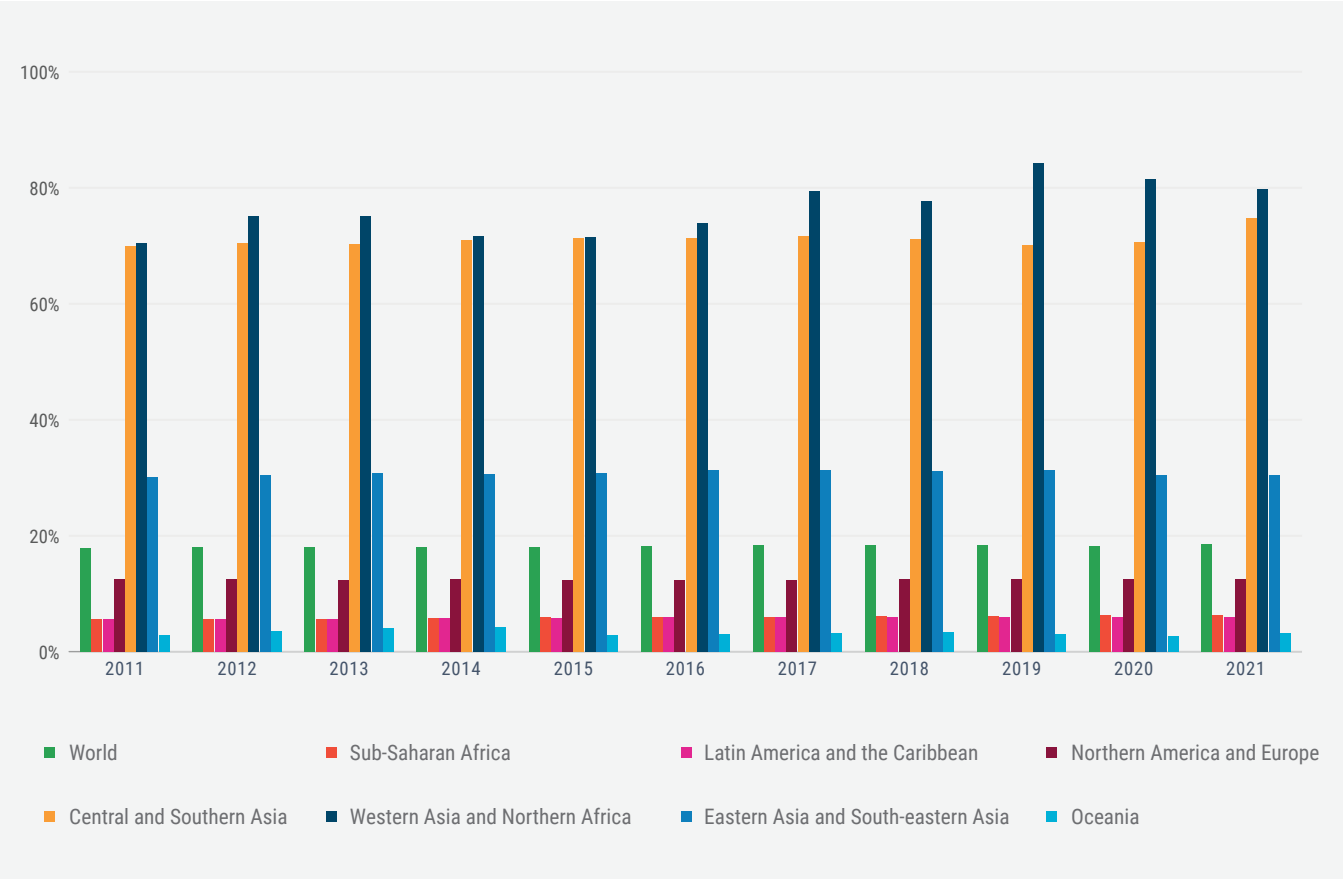
Key message: Most regions have witnessed a rise in water stress levels during the last few years; this rise is especially pronounced in Western Asia and Northern Africa.

FAO.2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024 https://data.apps.fao.org/aquastat/?lang=en).

Although there is a general increasing trend in water stress levels across all regions, the pattern is not always consistently linear as illustrated in Figure 7.

Therefore, it is useful to analyse longer time data series when assessing these trends in order to have a better understanding of the drivers of the change and be able to formulate effective strategies.

Figure 7. Water stress (%) in world regions 2011-2021



Key message: Over the past decade (2011 to 2021), water stress levels have risen in most regions across the globe.

FAO.2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024. https://data.apps.fao.org/aquastat/?lang=en).

The impact of economic sectors to water stress levels

Globally, agriculture emerges as the main user of water resources, accounting for 72 percent of total freshwater water withdrawals in 2021. Following agriculture, the industrial sector uses 15 percent while the service sector accounts for 13 percent of the total withdrawals. Table 1 shows the proportional impact of these economic sectors on the overall water stress levels.

Table 1. Contribution of the different sectors to the water stress level (percent)

	2015	2021
Contribution of the agriculture sector to the total water stress level (percent)	13.0	13.3
Contribution of the industrial sector to the total water stress level (percent)	2.9	2.8
Contribution of the services sector to the total water stress level (percent)	2.2	2.5
World Water stress level (percent)	**18.1**	**18.6**

Key message: Agriculture emerges as the main user of water resources, accounting for 72 percent of total freshwater water withdrawals in 2021 and it is the main contributor to water stress levels at the global level.

FAO.2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024 https://data.apps.fao.org/aquastat/?lang=en).

When examining water stress at regional levels (Table 2), agriculture continues to be main user of water resources aligning with the global trends. However, disparities emerge across regions and subregions, influenced by factors such as climate, geography, infrastructure and socioeconomic conditions. Industrial activities, including manufacturing, mining and energy production, also require substantial amounts of water.

Water-intensive industries like energy generation, textile manufacturing, chemical production and food processing can contribute to water stress, particularly in regions with high levels of industrialization such as Northern America and Europe. Urbanization and population growth drive increased demand for water in the service sector, particularly for domestic use, sanitation and recreational purposes. Urban areas often face water stress due to high population density and concentrated water demand, leading to challenges in water supply services and infrastructure development.

Table 2. Contribution of the different sectors to the water stress level in different world regions (%) in 2015 and 2021

Year	2015				2021			
Region/ Subregion	Water Stress 2015 (%)	Agriculture contribution (%)	Industrial sector contribution (%)	Service sector contribution (%)	Water Stress 2021 (%)	Agriculture contribution (%)	Industrial sector contribution (%)	Service sector contribution (%)
Central and Southern Asia	71.3	64.7	1.8	4.8	74.8	67.7	1.9	5.2
Central Asia	76.8	66.7	6.1	3.9	69.7	57.9	6.2	5.7
Southern Asia	78.1	71.2	1.5	5.4	83.2	75.9	1.6	5.7
Eastern Asia and Southeastern Asia	30.8	22.6	4.6	3.6	30.4	22.0	3.8	4.6
Eastern Asia	45.7	29.5	9.6	6.5	44.1	27.7	7.5	8.8
Southeastern Asia	20.2	17.3	1.2	1.7	20.6	17.6	1.2	1.7
Latin America and the Caribbean	5.8	4.2	0.7	0.9	6.0	4.5	0.6	0.9
Western Asia and Northern Africa	71.4	60.5	2.3	8.6	79.7	63.0	4.2	11.2
Northern Africa	104.7	89.6	1.6	13.5	120.6	99.0	5.6	16.0
Western Asia	57.7	48.5	2.6	6.5	62.9	48.2	3.6	9.2
Northern America and Europe	12.4	4.2	6.0	2.2	12.5	4.3	5.8	2.3
Europe	8.5	2.5	3.9	2.2	8.4	2.5	3.6	2.2
Northern America	20.2	7.5	10.0	2.7	20.2	7.6	9.9	2.7
Oceania	2.8	1.6	0.5	0.6	3.2	2.1	0.6	0.4
Sub-Saharan Africa	5.9	4.3	0.5	1.1	6.3	4.7	0.5	1.1
Landlocked developing countries	15.2	13.4	0.9	0.9	14.7	12.6	0.9	1.1
Small Island Developing States	3.6	2.2	0.7	0.7	3.7	2.3	0.7	0.7
Least developed countries	7.1	6.4	0.1	0.5	7.1	6.5	0.1	0.5

FAO.2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024. https://data.apps.fao.org/aquastat/?lang=en).

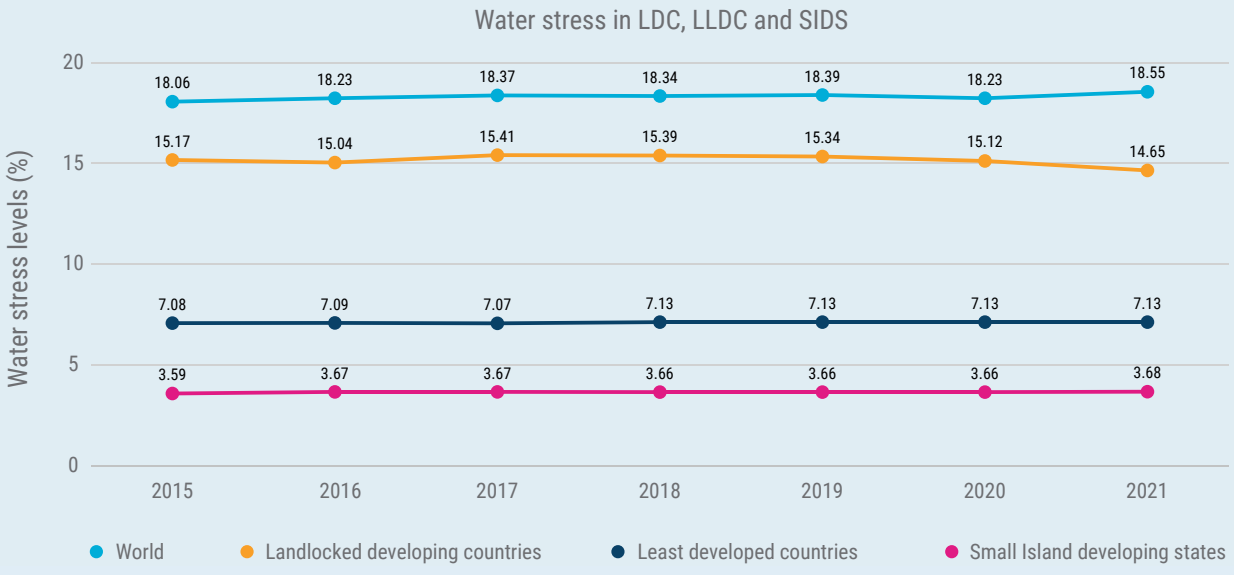
Box 3. Water Stress Levels in Least Developed Countries (LDCs), Land Locked Developed Countries (LLDCs) and Small Island Developing States (SIDSs)

UN-OHRLLS, established by the United Nations General Assembly in 2001, advocates for the LDCs, LLDCs and SIDS due to the countries' inherent vulnerabilities and socioeconomic instability. Unbalanced water stress levels can pose and signal severe challenges for LDCs, LLDCs and SIDS due to their inherent geographical and socioeconomic conditions.

LDCs are typically characterized by low income, inadequate infrastructure and limited access to resources. It is often the case that LDCs show low levels of water stress alongside poor basic drinking water and sanitation coverage or low agricultural productivity. This suggests a potential to enhance the management of water supply; however they frequently lack the necessary investment, institutional and/or technical capacity, or political stability to do so effectively.

LLDCs are a group of heterogeneous countries without direct access to the sea. Approximately 60 percent of their population reside in dryland areas, which makes them particularly vulnerable to climate change, land degradation and desertification. Additionally, Many LLDCs are also mountainous countries, suffering from melting glaciers, erosion and water shortages. The lack of access to the sea and the resultant high transportation costs also increase the expenses associated with developing water supply infrastructure.

SIDSs are a unique case for sustainable development given their distinct physical, demographic and economic features. SIDS have often limited availability of freshwater resources, with 71 percent of SIDS facing a risk of water shortage. In addition, SIDS are extremely vulnerable to natural disasters and the impacts of climate change, which significantly affect both the quality and quantity of freshwater resources.



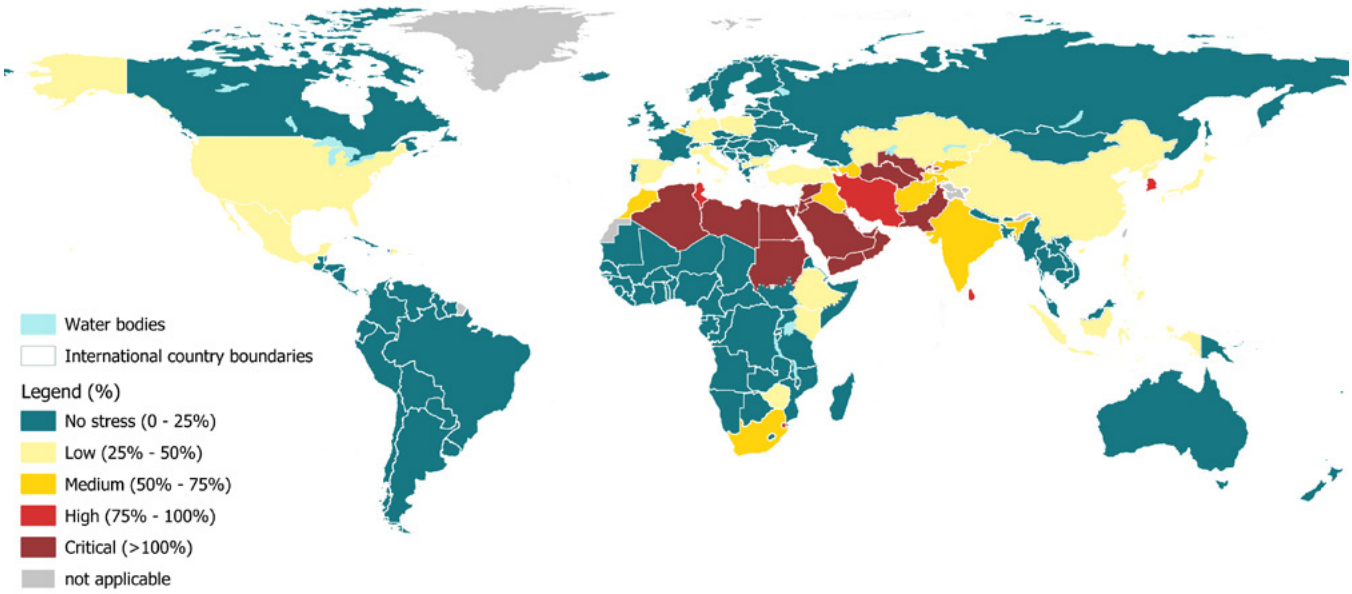
FAO.2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024 https://data.apps.fao.org/aquastat/?lang=en).

Despite average water stress levels in LDCs, LLDCs and SIDSs being below the global level, this often reflects underdeveloped water infrastructure rather than an abundance of water resources. Within these categories, some regions still experience high or critical water stress levels, primarily driven by agricultural demands, with the industrial and service sectors contributing less significantly.

To effectively address these vulnerabilities, these countries require integrated, climate-resilient water management strategies that tackle water scarcity, poverty and food insecurity. Additionally international support is critical, including financial assistance, investment, technology transfer and capacity building to support these countries to implement sustainable solutions.

Country-level water stress analysis

Figure 8. National Water Stress Levels (2021)[1]



Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.

Key message: In 2021, 13 percent of countries in the world are experiencing critical or high water stress levels mainly concentrated in Northern Africa and Western Asia.

Source: FAO. 2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024. https://data.apps.fao.org/aquastat/?lang=en

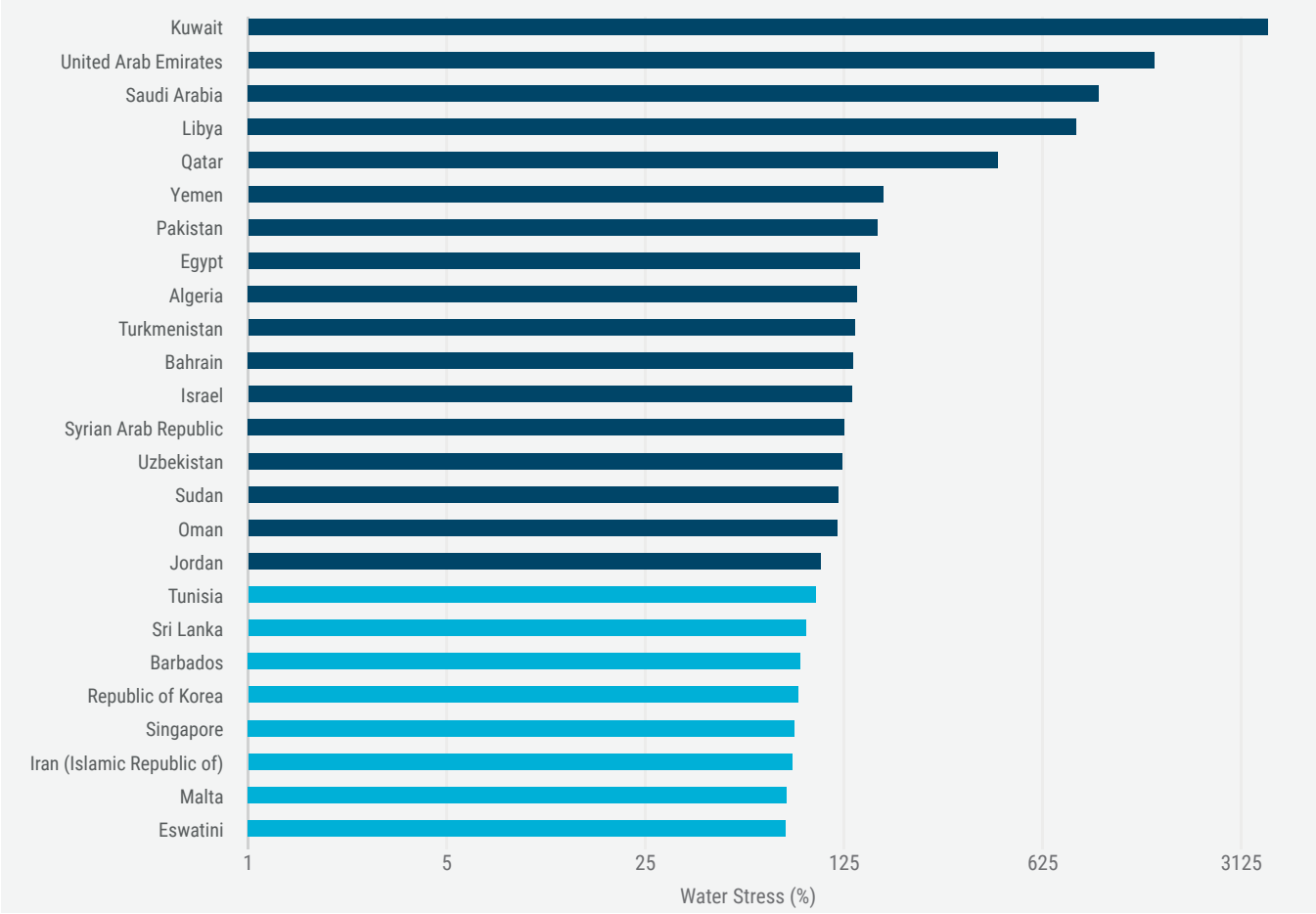
1 Note: the designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries

According to the data reported by countries in 2021, most countries show a "safe" level of water stress, below 50 percent (Figure 8). Specifically, the data show that 119 countries experienced no water stress (below 25 percent), 23 countries had low stress (between 25 and 50 percent) and 13 countries are faced with medium stress (between 50 and 75 percent). However national water stress values may hide important subnational variations at river basin level.

A total of 8 countries are confronting high levels of water stress (water stress exceeding 75 percent) and 17 countries are experiencing a critical water stress level (water stress over 100 percent), mainly concentrated in Northern Africa and Western Asia (Figure 9). These countries are unable to meet current water demands sustainably, suggesting significant deficits.

High levels of water stress are often indicative of over-exploitation of water resources, such as fossil aquifers, and a reliance on non-conventional water sources such as seawater desalination or wastewater reuse to meet freshwater demands. For instance, Egypt has launched a national plan to increase its desalination capacity, wastewater reuse and implement more efficient irrigation systems (Ministry of Planning and Economic Development, 2021). Similarly, countries like Kuwait, facing severe water stress, often rely on imported food to secure the nutritional needs for their population (National Committee for Sustainable Development in Kuwait, 2023). Five countries with high water stress levels have seen a decline in their stress levels since 2015 (Figure 10), meaning that efforts are taken to reduce the country's vulnerability to water stress.

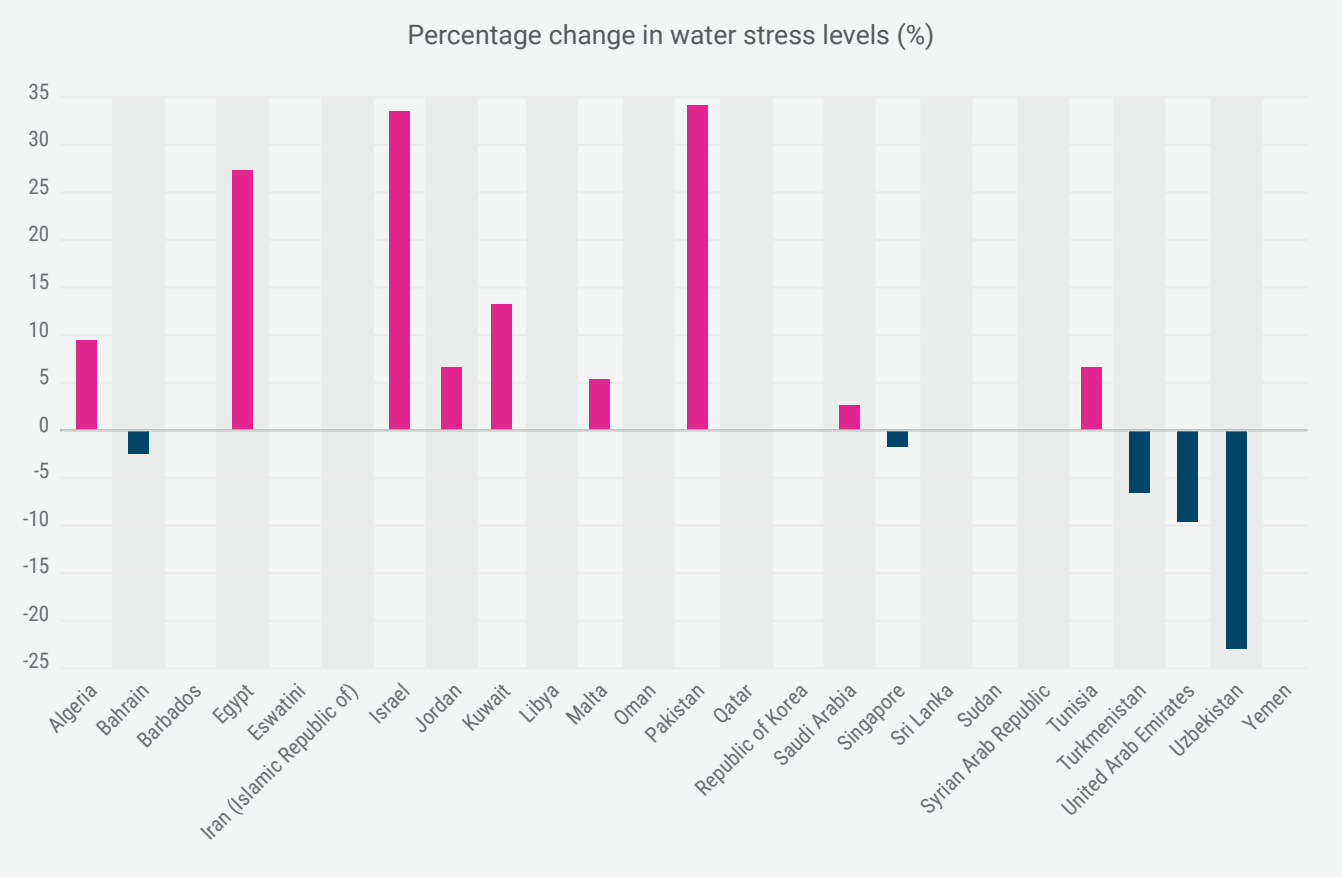
Figure 9. Countries with high and critical water stress levels (water stress level > 75%), 2021



Key message: Most water stressed countries are located in Northen Africa and Western Asia region. Kuwait, United Arab Emirates, Saudi Arabia, Libya and Qatar are the most water stressed countries in the world.

Source: FAO. 2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024. https://data.apps.fao.org/aquastat/?lang=en

Figure 10. Water stress level changes in countries with high and critical water stress levels

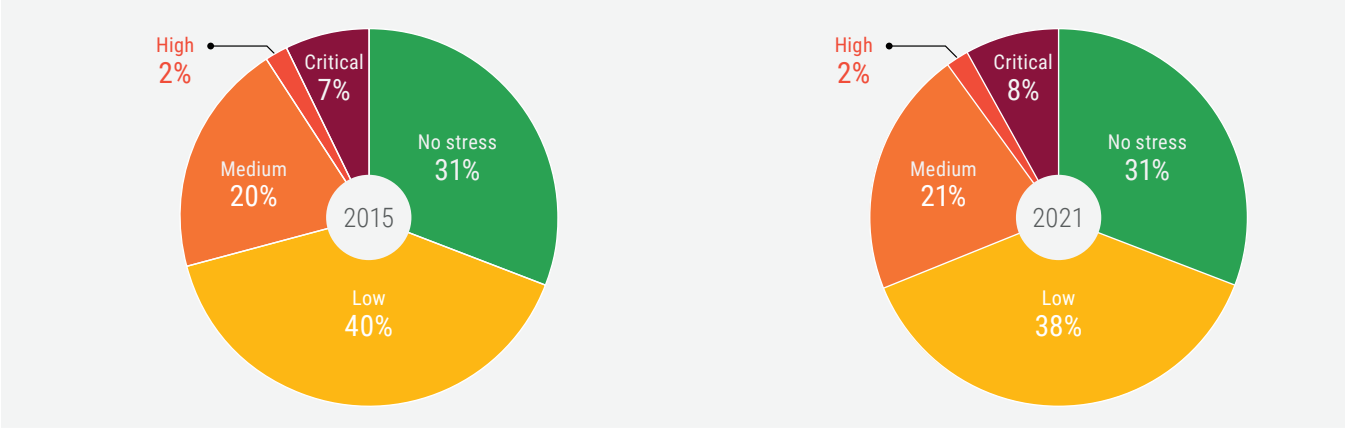


Key message: Five countries (Bahrain, Singapore, Turkmenistan, UAE and Uzbekistan) with high water stress levels have seen a decline in their stress levels since 2015.

Source: FAO. 2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024. https://data.apps.fao.org/aquastat/?lang=en

On average, approximately 10 percent of the global population live in countries with high and critical water stress levels. In 2021, over 791 million people lived in countries affected by high and critical water stress (Figure 11). This figure represents a slight increase since 2015, when over 721 million people lived in highly water stressed countries.

Figure 11. Percentage of the global population living in water stressed countries in 2015 and in 2021



Key message: On average, approximately 10 percent of the global population live in countries with high and critical water stress levels.

Source: FAO elaboration based on FAO, 2024

Challenges in addressing data gaps

One of the main challenges affecting the monitoring process of Indicator 6.4.2 pertains to the availability of accurate, comprehensive and up-to-date data. The global calculation of SDG Indicator 6.4.2 relies on data from 180 countries. Globally, over the past decade, 67 countries are not reporting water stress data, with a significant portion of these countries being SIDS. The absence of water stress information is primarily attributed to the lack of data regarding water withdrawals across economic sectors. However, it must be noted that factors such as conflicts or institutional instability may also impede a country's reporting capacity. Particularly concerning SIDS, the absence of EFR values is frequently observed, attributable to the limitations of the Global Environmental Flows Information System (GEFIS) model used for estimating environmental flows, in very small areas.

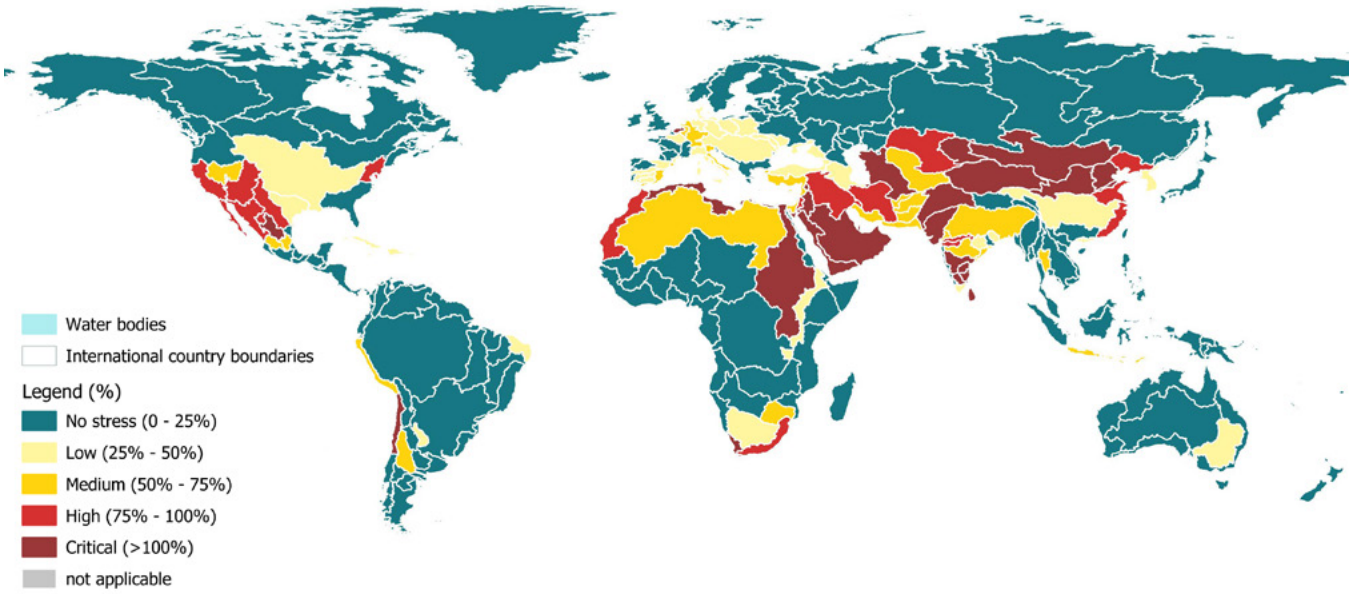
The monitoring process of 6.4.2 recognizes the diverse starting points of countries concerning the computation of water stress. The monitoring approach allows countries to initiate monitoring efforts in line with their national capacity and available resources. For instance, while some countries undertake their own estimations of EFR, others do not. Similarly, while some countries have the capacity to disaggregate the indicators by sector and by basin level, many fail to do it due to either lack of capacity or resources. Therefore, without concerted efforts by countries to address these limitations, updates and monitoring of the indicator cannot be effectively carried out.

Analysis of water stress at river basin level

The aggregation of water stress values at global, regional and country level masks significant disparities within the area considered. Therefore, disaggregating the indicator is crucial as it provides a better understanding of both the causes and impacts of water stress. Such disaggregation facilitates policy and decision makers to target interventions more effectively focusing on regions with high water stress and sectors with significant water use.

On a global scale, the spatial disaggregation of Indicator 6.4.2 was implemented using the water withdrawal data available in AQUASTAT at the national level, which were subsequently mapped onto the FAO World map of the major hydrological basins (FAO and UN Water, 2021). The methodology applied presents limitations due mainly to the availability of data at river basin level. However, the analysis serves to illustrate the importance to disaggregate water stress by hydrological units as it shows a different situation going beyond the aggregated values calculated for the national SDG assessments. The resulting map is depicted in Figure 12.

Figure 12. Level of water by major river basin, 2018-2021



Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.

Key message: The aggregation of water stress values at global, regional and country level masks significant disparities at river basin level. Countries like the United States, China, India, South Africa, Mexico, Peru or Chile despite having safe levels of water stress at national level, contain river basins that experience significant water stress.

Source: FAO.2024. AQUASTAT Database AQUAMAPS. Food and Agriculture Organization of the United Nations https://data.apps.fao.org/aquamaps/?lang=en&share=f-04cfeb65-1638-4fc9-89ba-5f9a5956b48e

Overall, the outcome of the disaggregation by major basin revealed the existence of a water stress belt spanning approximately between 10 degrees and 45 degrees north latitude, with a few additional areas located above and below this belt. The disaggregation gives a more comprehensive view of the global distribution of water stress, increasing the granularity of the information and allowing the identification of situations where country-level assessments may be hiding significant challenges at subnational level. Figure 13 shows that countries that may appear on the "safe side" of water stress may encompass stressed basins. Examples include the United States, China, India, South Africa, but also Mexico, Peru or Chile[2].

In this context, considering the importance of disaggregating SDG Indicator 6.4.2 on a more refined scale, FAO, as a partner of the UN-Water Integrated Monitoring Initiative for SDG 6 (IMI-SDG6) and custodian for monitoring of the SDG Target 6.4, has undertaken the disaggregation of the level or water stress at basin and sub-basin level in several pilot countries including Italy, Brazil and Rwanda.

The methodology applied in the pilot cases varied depending on the data, models and tools available. Based on the results of the cases studies, FAO is currently in the process of developing a standardized reference methodology for implementing the disaggregation of SDG Indicator 6.4.2 at basin and sub-basin level.

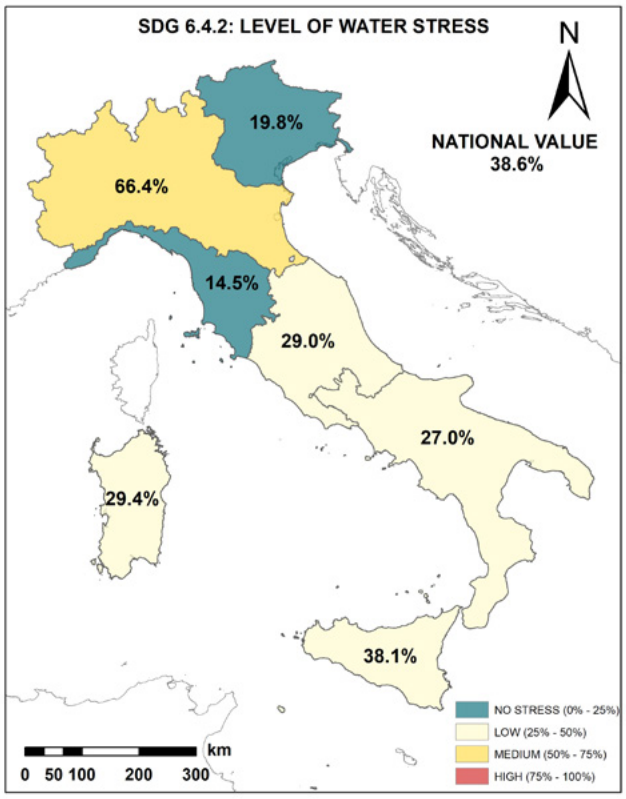
The standardized methodology will serve as a guiding framework for countries to analyse water stress and its components at sub-basin level. This will enable a deeper understanding of the impacts of local projects on water resource availability. Moreover, it will facilitate assessment of their impacts on the neighbouring basins

2 Methods, data and tools used to implement the disaggregation of SDG Indicator 6.4.2 are described in this publication: https://dx.doi.org/10.14324/111.444/ucloe.000026

and ensure the long-term sustainability of such projects in terms of water resources.

Case study 1: Italy – Disaggregation of SDG Indicator 6.4.2 using national models and statistical data

Figure 13. Disaggregation of water stress level at river basin scale in Italy



Key message: The spatial disaggregation of Indicator 6.4.2 in Italy showed that the Po river basin district in Northern Italy is experiencing a high water stress, exceeding 60 percent.

Source: FAO, ISPRA and ISTAT, 2023

This pilot was carried out in collaboration with the Italian Institute for Environmental Protection and Research (ISPRA) and the Italian National Institute of Statistics (ISTAT) and the analysis was performed considering the available freshwater resources during the different 30-year periods within the reference period 1951–2020 and the water withdrawal for the period 2015–2019.

The disaggregation of SDG Indicator 6.4.2 was implemented at river basin district (RBD) level. RBD territories are defined and prescribed by European Directive 2000/60/EC (Water Framework Directive – WFD) and identified by Italian Law no. 221/2015. Figure 13 shows the map of SDG 6.4.2 disaggregated at RBD level, where total renewable freshwater resources (TRWR) refers to the period 1991–2020 and water withdrawals refers to year 2015.

The total renewable freshwater resources have been estimated using the national model BIGBANG 5.0, developed by ISPRA, while the disaggregated values of the water withdrawals in the different economic sectors (service, agriculture and industry) have been assessed using specific methodologies developed by ISTAT. The EFR was derived by applying EFR percentages available in GEFIS for the present day to the TRWR estimated using the national model BIGBANG 5.0.

The results indicate that in comparison to the national computation, which suggests a low level of water stress in the country (approximately 30 to 40 percent, depending on the reference period), the spatial disaggregation of the indicator brought attention to a particular river basin district (RDB) experiencing a water stress exceeding 60 percent, namely, the district of the Po river basin in Northern Italy.

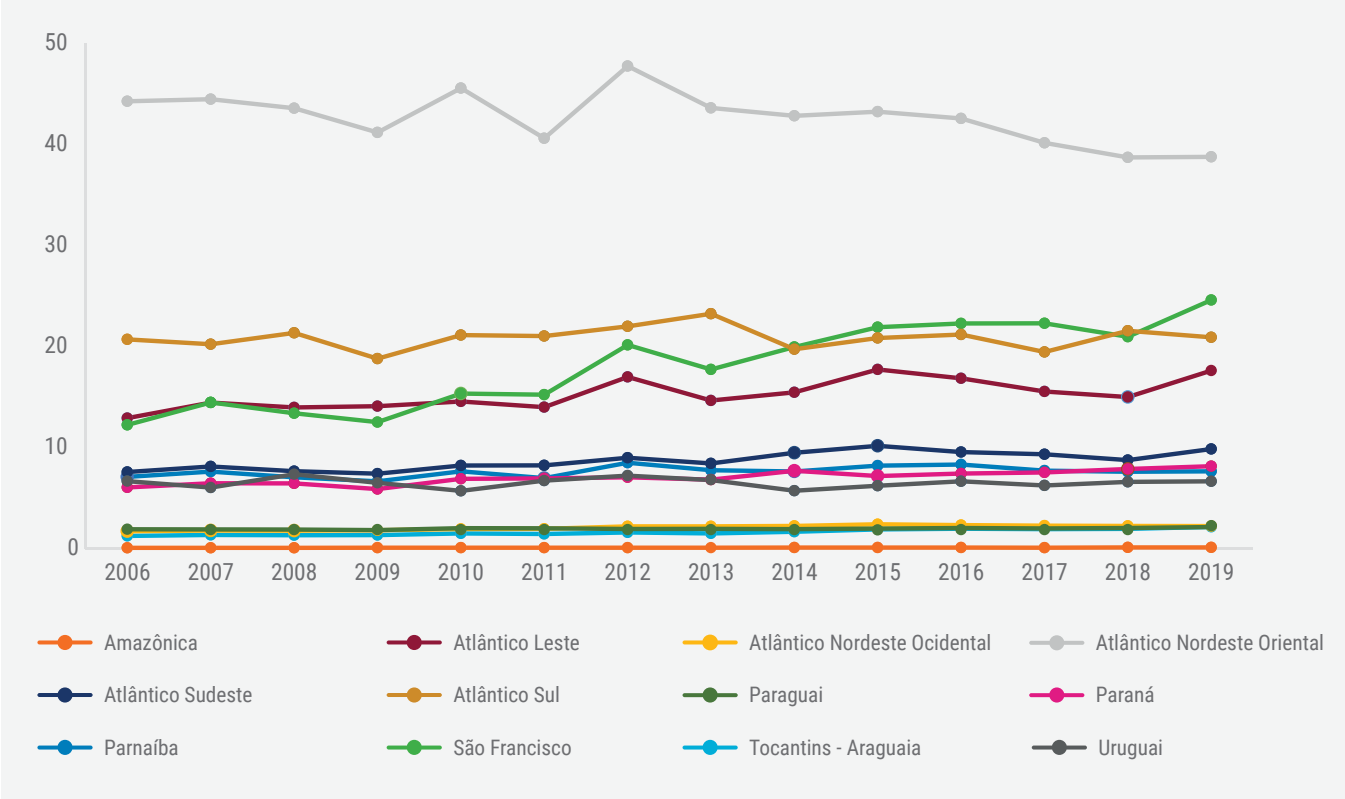
Case study 2: Brazil – Disaggregation of Indicator 6.4.2 combining models and ground station measurements

The pilot was carried out in collaboration with the Agência Nacional de Águas e Saneamento Básico (ANA) of Brazil. The disaggregation of SDG 6.4.2. was implemented using data from 2006 to 2016.

In Brazil, there are currently 1485 stream gauge stations that measure in near real time the discharge of rivers all over the country. Water data are organized in the Ottocodified Hydrographic database which includes not only data on water supplies but also time series of water demands, and water uses for each microbasin from 2006 onwards.

For the calculation of SDG Indicator 6.4.2, the total renewable freshwater resources by microbasin have been estimated using the long-term average series published by ANA in the Water Resources Report for 2017. Groundwater reserves were not considered in the calculation of SDG 6.4.2 as they are considered to contribute to the base flow of surface water bodies. For the EFR, ANA has applied a percentage of the average long-term flows which differs from the value proposed in GEFIS. Data on urban or industrial water withdrawals are available in near real time mainly on a point-to-point basis nationwide, and thus association to the microbasin is done by using the location of the point to which the data are associated. Data on agricultural water withdrawals are mainly related to crop areas and in this case the disaggregation is implemented using the land-use map.

Figure 14. Disaggregation of water stress level at river basin scale in Brazil



Key message: A single SDG 6.4.2 value for Brazil fails to capture the diverse conditions across its 12 hydrographic regions.

Source: ANA, 2019

Due to the large differences that characterize the national territory, a single value for Indicator 6.4.2 fails to capture the specific situation of all 12 Brazilian hydrographic regions. It is possible to discern the areas necessitating urgent management interventions by analysing the relationship between water demand and availability.

According to the results shown in Figure 14, the most critical regions include the "Atlântico Nordeste Oriental", situated within the semi-arid region of Brazil, and the "Atlântico Sul", characterized by significant water withdrawal for rice irrigation by flooding methods alongside the presence of densely populated urban centres. Moreover, attention should also be paid to the East Atlantic and the São Francisco regions, regions which have substantial demands in relation to available water resources.

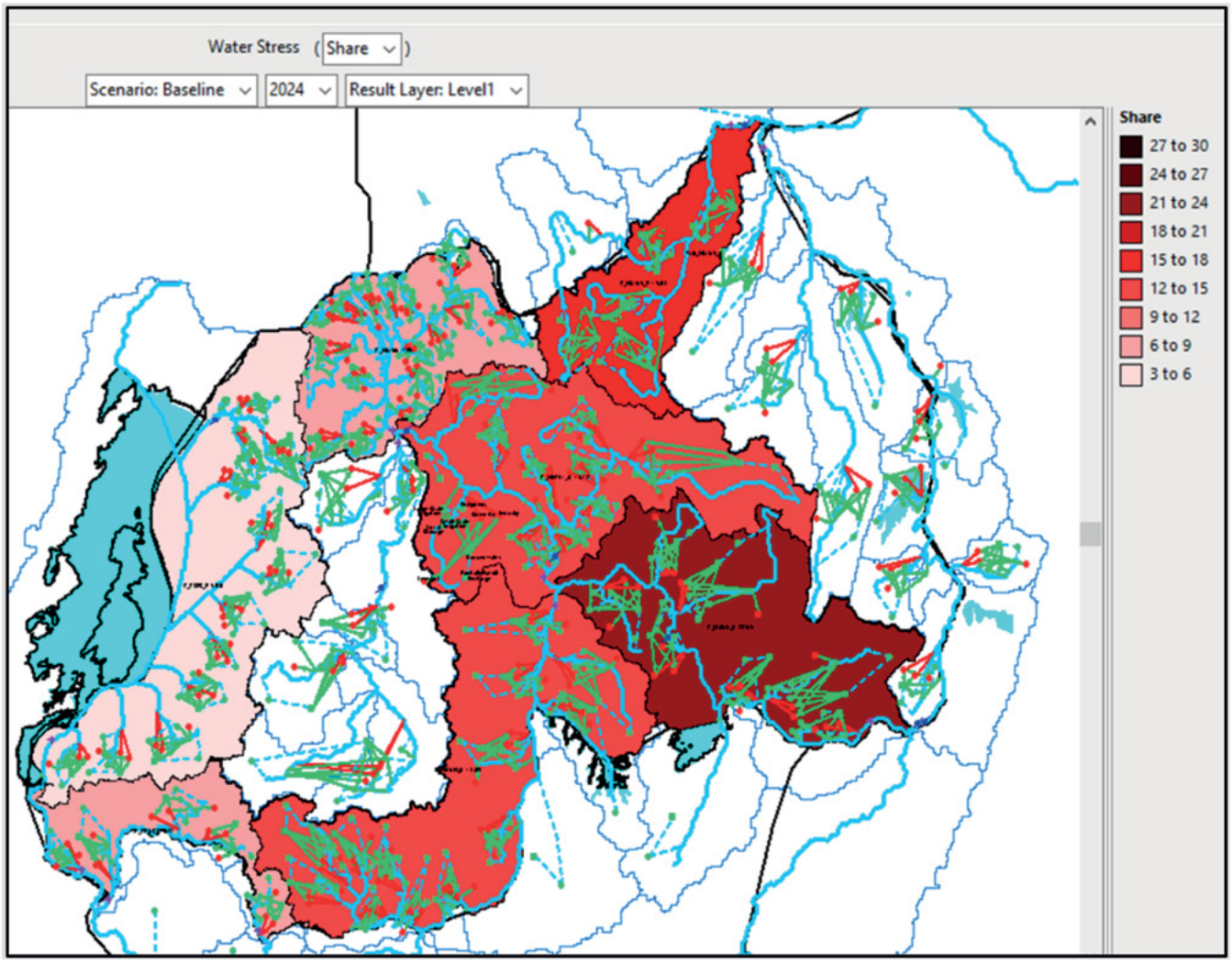
Case study 3: Rwanda – Disaggregation of Indicator 6.4.2 using the Water Evaluation and Planning System (WEAP) tool

The disaggregation of SDG 6.4.2 in Rwanda has been conducted by the IMI-SDG 6 project in close collaboration with the FAO project 'Knowing Water Better' (KNOWAT). This effort capitalized on the findings of the water accounting exercise initiated by the KNOWAT project. The disaggregation of SDG 6.4.2 at the sub-basin level was carried out using the WEAP tool developed by the Stockholm Environment Institute (SEI) and extensively adopted by Rwanda Water Resources Board (RWB). The WEAP tool has undergone enhancements to incorporate a water stress planning component which includes the calculation of SDG Indicator 6.4.2 (FAO, 2024). The analysis was performed across all level 1 catchments, utilizing data included in the report "Water Users and Uses Assessment in Rwanda" (RWB, 2020).

Regarding the EFR, a threshold of 30 percent of the TRWR to all the basins was applied, in alignment with the National Water Resources Master Plan of Rwanda.

While the overall water stress level in the country is not critical, the analysis of water stress at catchment level in the reference period 2020–2024 has revealed an upward trend in stress levels particularly in the basins of the Eastern and Southeastern regions (Figure 15). Moreover, detailed monthly data analysis indicates that water stress predominantly occurs during the dry season. For this reason, it is recommended to incorporate a seasonal analysis into the water stress analysis to avoid potential bias, particularly during the rainy season.

Figure 15. Disaggregation of water stress level at river basin scale in Rwanda



Key message: While the overall water stress level of Rwanda is not critical, spatial analysis from 2020–2024 shows an upward trend in water stress, particularly in the Eastern and Southeastern basins.

Source: Authors' own elaboration

Interlinkages of Indicator 6.4.2 and other sectors of the development agenda

Understanding gender linkages of SDG 6.4

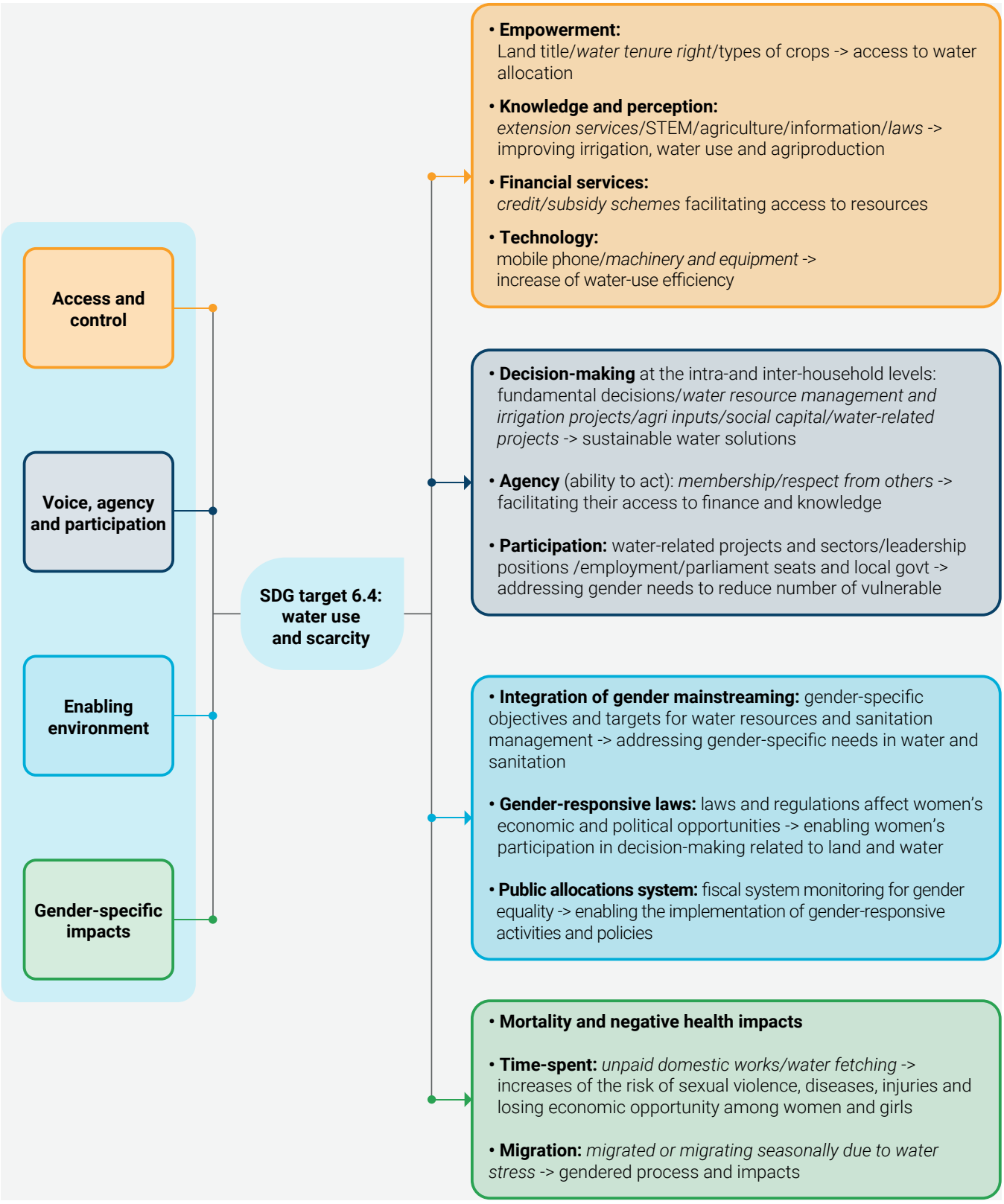
Women are disproportionately disadvantaged by their gender roles that limit their access and control over resources. Unequal distribution of resources and power imbalances result from the root causes of poverty and heavily impact people's capacity to adapt to changing environmental conditions. As with other natural resources, the management of water is intrinsically linked to gender relations and plays a critical role in determining the ways in which these resources are accessed, distributed and utilized by men and women.

Despite the critical importance of assessing the gender-specific impacts of water-related challenges, the inclusion of gender as a dimension of inequality in SDG 6 has only been considered until now for Indicator 6.1.1 (Proportion of population using safely managed drinking water services) and Indicator 6.2.1 (Access to adequate and equitable sanitation and hygiene). This inclusion is due to the fact that the methodologies to compute these indicators directly reference individuals. Nonetheless, there is potential to incorporate a gender perspective into other SDG 6 indicators in which data disaggregation by sex is not directly possible. This potential could be achieved through complementary analysis and/or aggregation of SDG indicator data with other relevant information, depending on the country context. With that view, the Integrated Monitoring Initiative for SDG6 (IMI-SDG6) is developing the approach referred to as gender contextualization of SDG 6 indicators, including those of the SDG 6.4 target.

SDG 6.4 indicators primarily focus on the economic and environmental dimensions of water use, not including demographic and social variables in the indicator formulas. As a consequence, there has been minimal analysis of how Indicators 6.4.1 and Indicator 6.4.2 interact with gender issues. However, the human dimension is evident at target level, which aims to "substantially reduce the number of people suffering from water scarcity". Examples of a meaningful gender contextualization of SDG 6.4.2 include, among others, the assessment of factors such as the accessibility technologies, land and water tenure rights across different gender groups.

As a part of the work on gender contextualization of SDG 6.4, a conceptual map showing the main thematic areas identified and used has been developed (Figure 16). It comprises four main thematic areas including: 1) access and control; 2) voice, agency and participation; 3) enabling environment; and 4) gender-specific impacts. Under each thematic area, various themes and subthemes draw potential linkages between gender and water-related topics. This map serves as basis for the formulation of a two-layer set of existing gender indicators, resulting in basic (see Annex 4) and advanced sets. These can be used by countries interested in exploring the linkages between SDG 6.4 indicators and gender dimensions, possibly applying the ladder approach. Both sets contain indicators with a clear methodology. The basic set of indicators offers a list of those for which data are often available. Meanwhile, the advanced set indicates those for which data are more sporadic, often collected under a project or a study with limited area of coverage. Further, the indicators are labelled with a three-level system showing the degree of relevant linkage to SDG 6.4 indicators. It also shows a possibility of use at either local/project level or at country level.

Figure 16. Conceptual map of the different sets of indicators to be applied to contextualize gender issues under SDG Target 6.4



In 2024, the work of IMI-SDG 6 is still ongoing, and the methodological approaches are being tested in several countries.

Interlinkages between the level of water stress and food security

Food insecurity is defined as the lack of regular access to enough safe and nutritious food for normal growth and development and an active and healthy life. Target 2.1 of the SDG aims at ending hunger and ensuring access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round. There are two indicators used to measure hunger and food insecurity under SDG 2.1: Indicator 2.1.2, which assesses the prevalence of undernourishment; and SDG 2.1.2 Prevalence of moderate or severe food insecurity in the population based on the Food Insecurity Experience Scale (FIES). FAO is the designated custodian agency for both indicators.

Global hunger, measured by the prevalence of undernourishment (PoU) (SDG 2.1.1) which estimates the proportion of the population whose habitual food consumption is insufficient to provide the dietary energy level as that required to maintain a normal active and healthy life. The PoU in the world increased notably due to the COVID-19 pandemic impact, reaching an average 9.2 percent of the population in 2022, compared with 7.9 percent in 2019. A large proportion of this population comes from all subregions in Africa, Western Asia and the Caribbean.

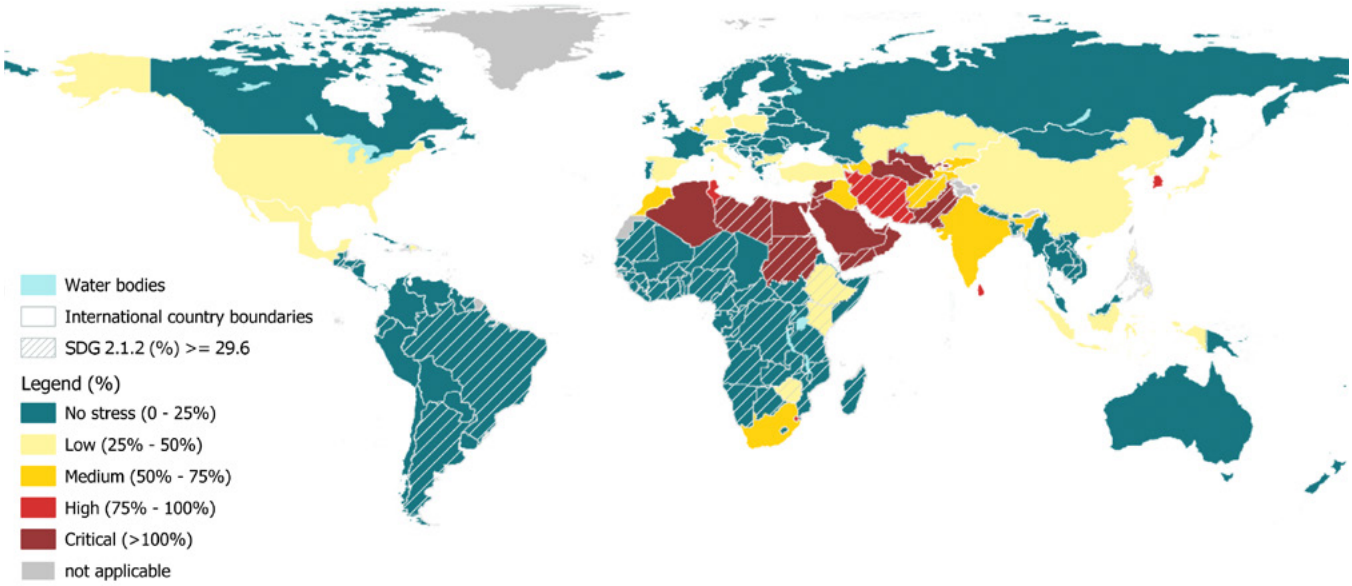
The SDG Indicator 2.1.2, which provides internationally comparable estimates of the proportion of the population facing moderate or severe food insecurity in the population, based on the FIES6, indicates that about 900 million people (11.3 percent of the world's population) were severely food insecure in 2022 and around 2.4 billion people face moderate to severe food insecurity (FAO, 2023). The main drivers for food insecurity include conflicts, economic slowdowns and downturns, and climate variability (FAO *et al*., 2023; Ringler *et al*., 2023).

While agrifood systems and food security are highly vulnerable to shocks and disruptions arising from conflict, climate variability and extremes, and economic contraction (FAO, 2023), water stress can further challenge the capacity of these systems to deliver nutritious, safe and affordable diets for all. Approximately 72 percent of freshwater withdrawals are used in agriculture (FAO, 2021), predominantly for irrigation. Irrigated lands, which constitute about 20 percent of the total cropland, are responsible for 40 percent of the world's food production. These figures underscore the significantly higher yields from irrigated areas compared to those dependent on rainfall. Additionally, access to irrigation contributes to more stable and reliable agricultural outputs amid climate variability, enhancing food security.

The level of water stress (SDG 6.4.2) measures the pressure of economic activities, including irrigation, on freshwater resources considering the total water withdrawals. Therefore, high water stress levels indicates that water use is reaching unsustainable levels, with intense competition from various sectors. This scenario can significantly limit irrigation and consequently agricultural productivity, posing a serious threat to food security. For example, it has been observed that when water scarcity has reduced irrigation, yields have been negatively impacted in semi-arid regions of North America (Elias *et al*., 2016). High levels of water stress may also restrict access to clean water and adequate sanitation, which in turn undermines the nutritional outcomes of food production. Limited water availability affects not only agricultural productivity, but also the safety and sanitary conditions in which food is prepared.

Figure 17 shows the countries with an SDG Indicator 2.1.2 (proportion of the population facing moderate food insecurity) above the global average of 19.6 percent, along with their respective levels of water stress. This mapping identifies countries where water stress constrains the development of agrifood systems. Figure 17 reveals that 69 countries have an SDG 2.1.2 level above the global average. Among these, 10 percent exhibit critical or high levels of water stress (including Yemen, Sudan, Pakistan, Libya, Barbados, Iran and Eswatini), while 13 percent experience medium or low levels of water stress. Notably, 77 percent of food-insecure countries show no significant water stress, often indicating low economic development and underdeveloped water infrastructure rather than an abundance of water resources.

Figure 17. Prevalence of moderate or severe food insecurity and water stress levels by country



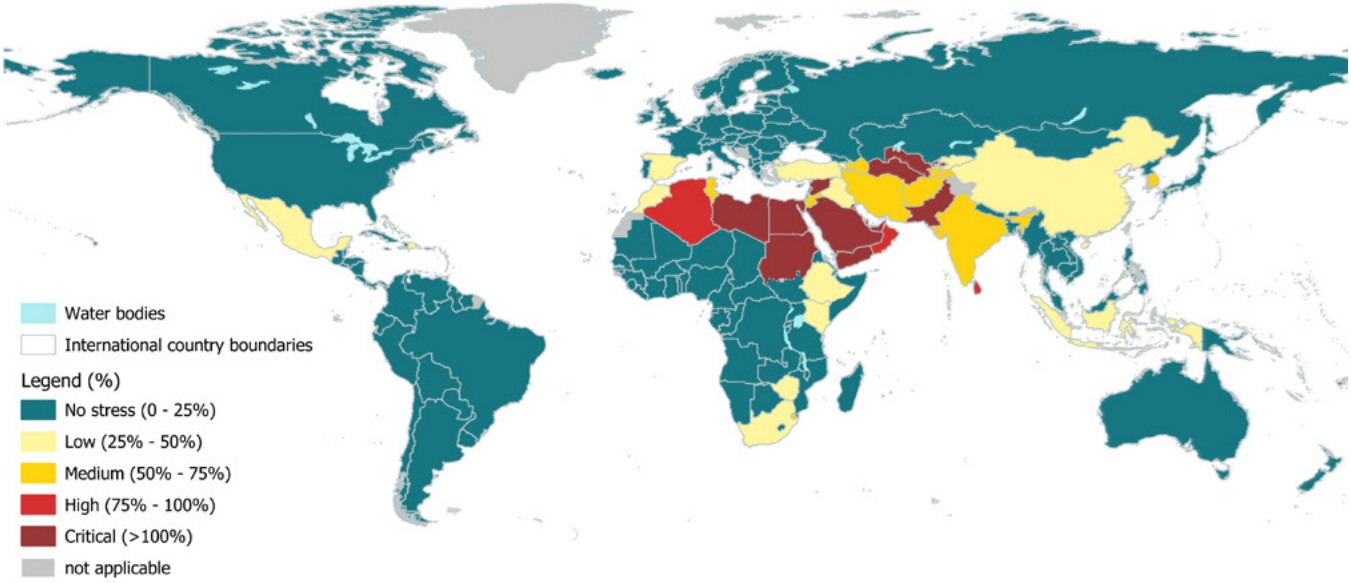
Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.

Key message: Water stress can be a constraint for the development of agrifood systems and food security. Ten percent of countries with a prevalence of moderate or severe food insecurity in the population above the global average (29.6 percent) also experience critical or high levels of water stress.

Source: FAO elaboration based on FAO, 2024.

On the other hand, irrigation significantly contributes to water stress level (Figure 18). An analysis of the level of water stress by farming systems reveals that in areas with high and critical water stress, irrigated agriculture is the predominant farming system (Figure 19). According to FAO (2020b), over 60 percent of irrigated cropland is highly water stressed (Figure 20).

Figure 18. Contribution of agriculture to water stress levels (2021)

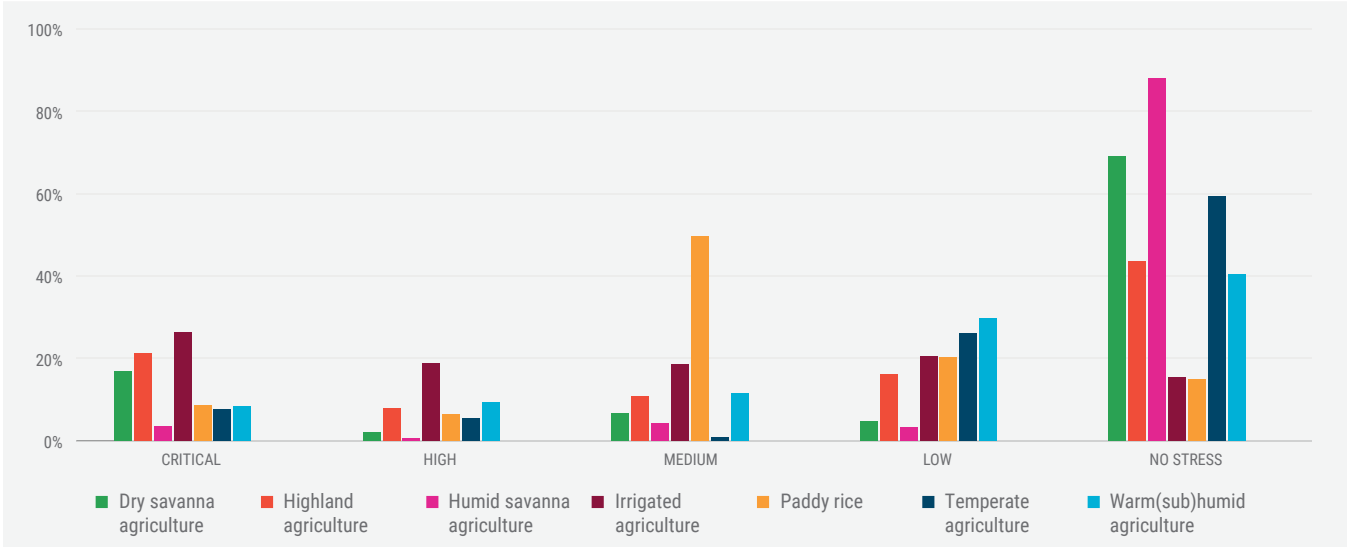


Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.

Key message: Agriculture significantly contributes to water stress worldwide.

Source: FAO. 2024. AQUASTAT Core Database. Food and Agriculture Organization of the United Nations. Database accessed on 1 March 2024. https://data.apps.fao.org/aquastat/?lang=en

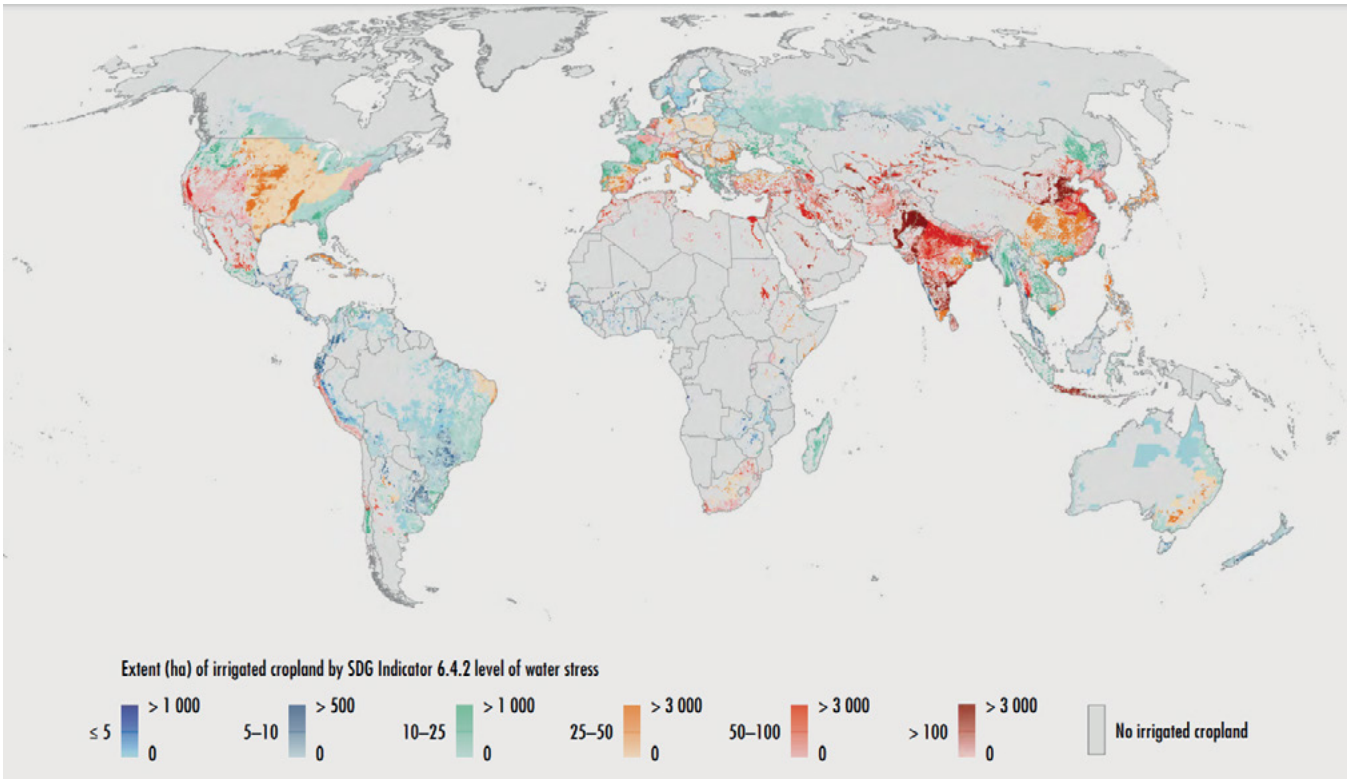
Figure 19. Major farming system occurrence (%) by water stress levels in major river basins



Key message: Irrigated agriculture is the predominant farming system in areas with high and critical water stress

Source: FAO and UN Water, 2021

Figure 20. Level of water stress on irrigated areas, 2015.



Key message: Over 60 percent of irrigated cropland is highly water stressed

Source: FAO, 2020

Conclusions and recommendations

Water stress remains a significant challenge for sustainable development. The monitoring results of SDG 6.4.2 since 2015 show that although the global average remains at a safe level, there is a concerning upward trend. This trend is attributed to factors such as the world's population growth, urbanization, improved living standards, changes in dietary habits and the intensifying impacts of climate change.

Water stress varies significantly across different regions, with some countries more vulnerable due to specific local conditions. The results underscore an urgent need to focus efforts in Northern Africa and Western Asia, where water stress levels are rising alarmingly. This high stress is primarily due to scarce water resources coupled with rapid population growth. To mitigate the impact of an expanding population on these limited water resources, it is essential to implement solutions such as the utilization of non-conventional water sources in the different economic sectors.

The spatial disaggregation of water stress levels is needed to capture subnational variations. The disaggregation provides a more detailed view of water stress distribution. It allows for the identification of significant local challenges that may be hidden by country-level assessments. Detailed, disaggregated information is also crucial for accelerating progress on this indicator, as it enables more precise targeting and implementation of mitigation actions. FAO is currently in the process of developing a standardized reference methodology for implementing the disaggregation of SDG Indicator 6.4.2 at basin and sub-basin level.

At the sectoral level, agriculture is both a significant contributor to and a victim of rising water stress levels. To accelerate progress, targeted efforts are needed to enhance water-use efficiency within the agricultural sector. This can be achieved through strategic investments and policies that focus on increasing water productivity in both irrigated and rainfed agriculture.

The sustainable management of water resources in agriculture not only enhances food security and progress towards SDG 2. However, rising water stress levels can restrict the use and expansion of irrigation systems, particularly in arid and semi-arid areas where agricultural productivity heavily relies on access to irrigation. Addressing these challenges is crucial for maintaining and improving agricultural output under varying climatic conditions.

If current agrifood systems continue unchanged, future scenarios predict persistent food insecurity, degradation of natural resources including water, and unsustainable economic growth (FAO, 2022). However, a range of policy and management options are available to tailor agrifood systems to local or regional circumstances, offering the potential for sustainable transformation.

Social and equity aspects are essential when analysing progress in SDG 6.4.2. Efforts to reduce water stress levels through the adoption of efficient technologies or improved governance must ensure that they do not disproportionately disadvantage vulnerable population. It is crucial that these initiatives promote fairness and inclusivity across social groups.

To address water stress and its associated challenges effectively, targeted actions are needed across different governance levels.

At the local level, communities should prioritize water conservation measures including rainwater harvesting, efficient irrigation practices and water recycling. Local authorities can also monitor water use and promote sustainability at the municipal level. Enhancing productivity in rainfed agriculture can alleviate pressure on freshwater resources for irrigation. This can be achieved through developing water harvesting infrastructure and implementing soil moisture conservation techniques.

National governments must develop integrated water management policies and plans that encompass conservation, management and equitable distribution of water resources, supported by working towards SDG 6.5.1 on implementation of integrated water resources management (UNEP, 2024). This can involve investing in grey or green infrastructure for water storage and distribution, enforcing regulations to prevent pollution and overextraction, and promoting public awareness campaigns on water conservation as well as economically incentivize its application. Economic activities and infrastructure projects should consider water sustainability and resilience to climate change.

Regionally, collaboration among neighbouring jurisdictions is crucial for addressing shared water challenges. Establishing agreements and mechanisms for

cooperative management of transboundary water sources can help prevent conflicts and ensure fair and sustainable use. Regional bodies can also facilitate knowledge exchange, capacity building, research and monitoring and joint initiatives to mitigate water stress and promote resilience to climate change impacts.

Investment Banks and Donors can allocate financial resources for water-related projects, including infrastructure development, capacity building, and technology adoption, prioritizing investments in areas facing acute water stress and vulnerability. They can provide funding and support for research and innovation in water technology, such as desalination, water recycling and efficient irrigation systems, to address water scarcity challenges. Furthermore, they can tie funding to adherence to sustainable water management practices, ensuring that recipient countries and projects prioritize environmental conservation, social equity and long-term water security.

The Private Sector must adopt water stewardship practices, including water efficiency measures, pollution prevention and community engagement initiatives. They can promote water sustainability by investing in technologies and solutions such as wastewater recycling systems, water-efficient products and sustainable agricultural practices. It is also crucial that they collaborate with governments, non-governmental organizations (NGOs), and other stakeholders to promote sustainable water management practices and address water-related challenges in supply chains and operations.

FAO and the 2030 Agenda

According to FAO's Strategic Framework 2022–2031, the path to reduce water stress and increase water-use efficiency passes through sustainable agrifood systems. FAO is supporting the 2030 Agenda through the transformation to MORE efficient, inclusive, resilient and sustainable agrifood systems for better production, better nutrition, a better environment and a better life – leaving no one behind.

- Better Production: ensure sustainable consumption and production patterns, through efficient and inclusive food and agriculture supply chains at local, regional and global levels, ensuring resilient and sustainable agrifood systems in a changing climate and environment.
- Better Nutrition: end hunger, achieve food security and improve nutrition in all its forms, including promoting nutritious food and increasing access to healthy diets.
- Better Environment: protect, restore and promote sustainable use of terrestrial and marine ecosystems, and combat climate change through more efficient, inclusive, resilient and sustainable agrifood systems.
- Better Life: promote inclusive economic growth by reducing inequalities (such as between urban and rural areas, rich and poor countries and men and women).

Recommendations for the reporting process

Improving the reporting process of SDG indicators is crucial for tracking progress, fostering accountability and ensuring informed decision-making based on accurate data towards a more sustainable future.

Here are a few actions that lead to improved monitoring of SDG 6.4.2:

- Enhance data collection: strengthening national capacities for data gathering to improve monitoring and response rates, particularly in low-income countries and improving intersectoral coordination in data gathering.
- Supplement statistical data with geospatial and remote sensing technologies to overcome data scarcity and enhance the accuracy and timeliness of water stress assessments.
- Disaggregate SDG Indicator 6.4.2: Improve the ability of countries to disaggregate SDG Indicator 6.4.2 across various spatial, temporal and sectoral scales. This will provide a more detailed and nuanced understanding of water stress.
- Integrate the impact of climate change on water stress levels: Consider the effects of climate change on total renewable water resources and the estimation of EFR. This integration is crucial for developing adaptive management strategies under changing climatic conditions.
- Foster communication between data agencies and decision makers: Enhance the flow of information between data-collection agencies and decision makers at both national and basin levels to ensure data-driven policymaking.

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Annexes

Annex 1. Water stress level by country

Country	Water Stress 2015 (percentage)	Water Stress 2021 (percentage)	Change in water stress
Afghanistan	54.76	54.76	0.00
Albania	5.53	4.78	-0.75
Algeria	125.99	137.92	11.93
Angola	1.87	1.87	0.00
Antigua and Barbuda	8.46	8.46	0.00
Argentina	10.46	10.46	0.00
Armenia	66.01	59.85	-6.15
Australia	3.71	4.60	0.89
Austria	9.11	8.68	-0.43
Azerbaijan	51.62	57.27	5.65
Bahrain	137.16	133.71	-3.45
Bangladesh	5.72	5.72	0.00
Barbados	87.50	87.50	0.00
Belarus	4.77	4.70	-0.08
Belgium	49.07	51.88	2.81
Belize	1.26	1.26	0.00
Benin	0.98	0.98	0.00
Bermuda	4.24	4.24	0.00
Bhutan	1.41	1.41	0.00
Bolivia (Plurinational State of)	1.22	1.24	0.03
Bosnia and Herzegovina	2.78	2.03	-0.74
Botswana	1.96	2.44	0.48
Brazil	3.02	1.48	-1.54
Brunei Darussalam	3.47	3.47	0.00
Bulgaria	41.61	37.52	-4.09
Burkina Faso	7.82	7.82	0.00
Burundi	10.19	10.19	0.00
Cabo Verde	37.28	57.18	19.89
Cambodia	1.04	1.04	0.00
Cameroon	1.56	1.56	0.00
Canada	3.68	3.73	0.05
Central African Republic	0.34	0.34	0.00

Country	Water Stress 2015 (percentage)	Water Stress 2021 (percentage)	Change in water stress
Chad	4.29	4.29	0.00
Chile	8.98	8.98	0.00
China	43.22	41.52	-1.70
Colombia	3.89	4.39	0.51
Comoros	0.83	0.83	0.00
Congo	0.03	0.03	0.00
Costa Rica	5.45	5.88	0.43
Côte d'Ivoire	5.09	5.09	0.00
Croatia	1.38	1.48	0.10
Cuba	23.94	23.94	0.00
Cyprus	31.71	32.12	0.41
Czechia	24.33	20.51	-3.82
Democratic People's Republic of Korea	27.74	27.74	0.00
Democratic Republic of the Congo	0.23	0.23	0.00
Denmark	21.95	26.40	4.45
Djibouti	6.33	6.33	0.00
Dominica	10.00	10.00	0.00
Dominican Republic	39.55	39.55	0.00
Ecuador	6.78	6.78	0.00
Egypt	110.93	141.17	30.24
El Salvador	13.21	13.21	0.00
Equatorial Guinea	0.18	0.18	0.00
Eritrea	11.18	11.18	0.00
Estonia	17.48	10.82	-6.66
Eswatini	77.56	77.56	0.00
Ethiopia	31.51	32.26	0.75
Fiji	0.30	0.30	0.00
Finland	6.46	7.11	0.65
France	24.61	21.60	-3.02
Gabon	0.50	0.50	0.00
Gambia	2.21	2.21	0.00
Georgia	5.27	5.24	-0.03
Germany	40.89	35.35	-5.54
Ghana	6.27	6.31	0.04
Greece	20.04	20.68	0.64
Grenada	7.05	7.05	0.00
Guatemala	5.74	5.74	0.00
Guinea	1.26	1.37	0.11

Country	Water Stress 2015 (percentage)	Water Stress 2021 (percentage)	Change in water stress
Guinea-Bissau	1.50	1.50	0.00
Guyana	3.30	3.30	0.00
Haiti	13.38	13.38	0.00
Honduras	4.62	4.62	0.00
Hungary	6.96	8.07	1.11
Iceland	0.38	0.39	0.01
India	66.49	66.49	0.00
Indonesia	28.78	29.70	0.91
Iran (Islamic Republic of)	81.29	81.29	0.00
Iraq	49.02	59.58	10.56
Ireland	5.79	7.61	1.82
Israel	98.87	132.00	33.13
Italy	29.92	29.65	-0.28
Jamaica	7.67	12.38	4.71
Japan	36.74	36.05	-0.70
Jordan	96.16	102.52	6.36
Kazakhstan	30.04	34.10	4.06
Kenya	26.55	33.24	6.69
Kuwait	3399.00	3850.50	451.50
Kyrgyzstan	50.04	50.04	0.00
Lao People's Democratic Republic	5.12	4.79	-0.33
Latvia	1.04	1.07	0.03
Lebanon	58.79	58.79	0.00
Lesotho	2.57	2.57	0.00
Liberia	0.26	0.26	0.00
Libya	817.14	817.14	0.00
Lithuania	2.75	1.83	-0.92
Luxembourg	3.71	3.96	0.25
Madagascar	11.26	11.26	0.00
Malawi	17.50	17.50	0.00
Malaysia	3.19	3.44	0.25
Maldives	15.67	15.67	0.00
Mali	8.00	8.00	0.00
Malta	82.77	78.28	-4.49
Mauritania	13.25	13.25	0.00
Mauritius	22.25	21.96	-0.29
Mexico	32.13	45.02	12.88

Country	Water Stress 2015 (percentage)	Water Stress 2021 (percentage)	Change in water stress
Mongolia	3.15	3.40	0.24
Morocco	50.75	50.75	0.00
Mozambique	1.75	1.75	0.00
Myanmar	5.80	5.80	0.00
Namibia	0.86	0.86	0.00
Nepal	8.31	8.31	0.00
Netherlands (Kingdom of the)	15.97	16.08	0.11
New Zealand	8.05	8.05	0.00
Nicaragua	2.42	2.22	-0.20
Niger	7.34	11.02	3.68
Nigeria	9.67	9.67	0.00
North Macedonia	20.83	37.97	17.14
Norway	2.06	2.01	-0.05
Oman	116.71	116.71	0.00
Pakistan	120.79	162.07	41.28
Palestine	41.53	47.75	6.22
Panama	0.93	0.90	-0.03
Papua New Guinea	0.13	0.13	0.00
Paraguay	1.84	1.84	0.00
Peru	5.63	7.18	1.55
Philippines	26.41	27.21	0.79
Poland	36.16	32.08	-4.09
Portugal	17.30	12.32	-4.99
Puerto Rico	19.54	19.54	0.00
Qatar	431.03	431.03	0.00
Republic of Korea	85.22	85.22	0.00
Republic of Moldova	12.47	12.56	0.09
Réunion	5.30	4.30	-1.00
Romania	6.05	7.36	1.31
Russian Federation	3.97	4.12	0.15
Rwanda	16.57	20.20	3.63
Saint Kitts and Nevis	50.83	50.83	0.00
Saint Lucia	14.30	14.30	0.00
Saint Vincent and the Grenadines	7.90	7.90	0.00
São Tome and Principe	1.81	1.88	0.07
Saudi Arabia	948.88	974.17	25.29
Senegal	12.99	16.28	3.29

Country	Water Stress 2015 (percentage)	Water Stress 2021 (percentage)	Change in water stress
Serbia	5.28	5.69	0.41
Sierra Leone	0.50	0.50	0.00
Singapore	84.58	83.12	-1.47
Slovakia	2.47	2.44	-0.03
Slovenia	6.06	6.29	0.23
Somalia	24.53	24.53	0.00
South Africa	59.75	66.89	7.14
South Sudan	4.23	4.23	0.00
Spain	42.96	43.25	0.30
Sri Lanka	90.79	90.79	0.00
Sudan	118.66	118.66	0.00
Suriname	3.95	3.95	0.00
Sweden	3.43	3.58	0.16
Switzerland	6.51	6.50	-0.01
Syrian Arab Republic	124.36	124.36	0.00
Tajikistan	68.74	69.94	1.20
Thailand	23.01	23.01	0.00
Timor-Leste	28.27	28.27	0.00
Togo	3.39	3.39	0.00
Trinidad and Tobago	20.33	20.33	0.00
Tunisia	92.02	98.11	6.09
Türkiye	39.89	43.38	3.48
Turkmenistan	144.73	135.21	-9.52
Uganda	5.83	5.83	0.00
Ukraine	11.80	12.26	0.45
United Arab Emirates	1696.36	1533.33	-163.03
United Kingdom of Great Britain and Northern Ireland	13.91	14.35	0.44
United Republic of Tanzania	12.96	12.96	0.00
United States of America	28.16	28.16	0.00
Uruguay	9.79	9.79	0.00
Uzbekistan	158.13	121.84	-36.29
Venezuela (Bolivarian Republic of)	7.54	7.54	0.00
Viet Nam	18.13	18.13	0.00
Yemen	169.76	169.76	0.00
Zambia	2.84	2.84	0.00
Zimbabwe	31.87	46.09	14.22

Annex 2. Methodology and data collection

How to calculate the water stress indicator?

Indicator 6.4.2 has been defined as the ratio between total freshwater withdrawn (TFWW) by all major sectors and total renewable freshwater resources (TRWR), after considering environmental flow requirements (EFR). It is calculated using the following formula:

$$\text{Water Stress (\%)} = \frac{TFWW}{TRWR - EFR} * 100$$

The indicator is computed as the divided by the difference between the TRWR and the EFR, multiplied by 100. All variables are expressed in km^3/year (10^9 m^3/year).

- TRWR are calculated as the aggregate of two components: (a) internal renewable water resources (IRWR) and (b) external renewable water resources (ERWR). The term "water resources" is understood here as freshwater resources.
    - a. IRWR are defined as the long-term average annual flow of rivers and recharge of groundwater for a given country generated from endogenous precipitation.
    - b. ERWR refer to the flows of water entering the country, taking into consideration the quantity of flows reserved to upstream and downstream countries through agreements or treaties.
- TFWW is defined as the volume of freshwater extracted from its source (rivers, lakes, aquifers) for agriculture, industries and services. It is estimated at the country level for the following three main sectors: agriculture, services (including domestic water withdrawals) and industries (including cooling of thermoelectric plants).
- Freshwater withdrawal includes fossil groundwater. It does not include direct use of non-conventional waters, i.e. direct use of treated wastewater, direct use of agricultural drainage water and desalinated water. TFWW is in general calculated as being the sum of total water withdrawal by sector minus the direct use of wastewater, direct use of agricultural drainage water and use of desalinated water.
- EFR are defined as the quantity and timing of freshwater flows and levels necessary to sustain aquatic ecosystems which, in turn, support human cultures, economies, sustainable livelihoods and well-being. Water quality and also the resulting ecosystem services are excluded from this formulation which is confined to water volumes. This does not imply that water quality and the support to societies which are dependent on environmental flows are not important and should not be taken care of. These important factors are indeed considered by other targets and indicators, such as 6.3.2 (Proportion of bodies of water with good ambient water quality), 6.5.1 (Degree of integrated water resources management implementation) and 6.6.1 (Change in the extent of water-related ecosystems over time).

Country-led national data collection and AQUASTAT database aggregation

Countries are responsible for collecting and sharing indicator data for global reporting. For SDG Indicator 6.4.1 and Indicator 6.4.2, data is collected every year through the AQUASTAT network of national correspondents. AQUASTAT is FAO's global information system on water resources and agricultural water management. IMI-SDG6's role at FAO is to support the countries in the process, and together with FAO's AQUASTAT team, compile and verify the data and send it to the UNSD which publishes data to inform the High-Level Political Forum annually.

AQUASTAT collects, analyses and disseminates data on national and regional water resources since 1994 enabling policymakers, researchers and stakeholders to make informed decisions and develop effective strategies for sustainable water management. The data-collection process for SDG 6.4.2 relies on a network of national correspondents officially appointed by the government. Questionnaires are dispatched annually during the first semester of the year. Throughout the data-collection process, national correspondents are mainly responsible for ensuring data quality and coordination at country level. Having national coordination in place will ensure the timely and consistent collection of the data on a regular basis. Data for this indicator's components are usually collected by national ministries and institutions that have water-related thematic areas in their mandate, such as the ministries of water resources, agriculture, industry or environment.

Countries compile their different variables in the questionnaire (see Annex 3) that is sent back to FAO, which produces the regional and global aggregates. Once countries submit the data, there is a validation process by AQUASTAT to ensure the quality and consistency of the data. This validation includes a regular dialogue with national correspondents.

The TFWW and TRWR variables have been monitored by AQUASTAT since 1994. Regarding the estimation of the EFR, most countries lack a specific methodology for computing EFR. In order to derive EFR values, FAO uses the guidelines based on the GEFIS, accessible via http://eflows.iwmi.org which offers a standardized approach (FAO, 2019).

Annex 3. AQUASTAT questionnaire

The primary scope of the questionnaire is to obtain a comprehensive picture of water resources and uses at the national level, along with the description of their major characteristics, trends, constraints and perspectives, with particular focus on the agricultural sector, through systematic data collection, harmonized definitions and metadata. The questionnaire is also designed to collect a selection of SDG-related data on water resources, water use and irrigation in standardized manner annually. Reporting burden of the countries was considered throughout the design of this questionnaire, which is purposefully short (35 variables).

The questionnaire is composed of:

- Three introductory sections: Cover page, Instructions, Definitions
- One data reporting section, including national data on water withdrawal, dam capacity, municipal wastewater, irrigation and drainage
- Two supplementary information sections: Metadata, Feedback

The questionnaire is available in three languages: English, French and Spanish.

In addition, to the annual data collection, a more complete questionnaire will be sent every 5 years to populate other AQUASTAT databases.

In parallel and to support the change of data-collection methodology, the AQUASTAT team organized workshops for the national correspondents to develop the national capacities on water monitoring.

NATIONAL DATA

	Water Resources	Unit	2019	2020	2021
	Total Renewable Water Resources (Long-term average)	10^9 m^3/year			

I	Water withdrawals				
I.1.	**Water withdrawals by sector**	**Unit**	**2019**	**2020**	**2021**
	Total water withdrawal	10^9 m^3/year			
	Agricultural water withdrawal: total				
	Water withdrawal for irrigation				
	Water withdrawal for livestock (watering and cleaning)				
	Water withdrawal for aquaculture				
	Municipal water withdrawal				
	Industrial water withdrawal (incl. water for cooling of thermoelectric plants)				
	Water withdrawal for cooling of thermoelectric plants				
	Environmental flow requirements (stable over time)				
I.2.	**Water withdrawals by source**	**Unit**	**2019**	**2020**	**2021**
	Total surface water and groundwater withdrawal (freshwater)	10^9 m^3/year			
	Surface water withdrawal				
	Groundwater withdrawal				
	Desalinated water produced				
	Direct use of treated municipal wastewater				
	Direct use of agricultural drainage water				

II	Municipal wastewater	Unit	2019	2020	2021
	Produced municpal wastewater	10^9 m^3/year			
	Collected municipal wastewater				
	Treated municipal wastewater				

III	Irrigation and drainage				
III.1.	Area under agricultural water management	Unit	2019	2020	2021
	Total agricultural water managed area	1000 ha			
	Area equipped for irrigation: total				
	Area equipped for irrigation: part actually irrigated				
	Area equipped for full control irrigation: total				
	Area equipped for full control irrigation: part actually irrigated				
	Area equipped for full control irrigation: surface irrigation				
	Area equipped for full control irrigation: sprinkler irrigation				
	Area equipped for full control irrigation: localized irrigation				
	Area equipped for irrigation: equipped lowland areas				
	Area equipped for irrigation: spate irrigation				
	Cultivated wetlands and inland valley bottoms non-equipped				
	Flood recession cropping area non-equipped				
III.2.	Irrigated production				
	Total harvested irrigated crop area (full control irrigation only)	1000 ha			

III.3.	Drainage				
	Area equipped for irrigation drained	1000 ha			

IV	Environment	Unit	2019	2020	2021
	Area salinized by irrigation	1000 ha			

SDG INDICATOR 6.4.1 ON WATER USE EFFICIENCY - COMPUTATION (in USD/m^3)

This worksheet is a tool to automatically calculate the SDG indicator 6.4.1 on water use efficiency. Please do not touch: no compilation is required. It is automatically filled in based on the data you provided in the "National Data" worksheet and some additional data (see table below). If the indicator is not calculated, too many variables are missing: please check if you can fill in more variables in the "National data" worksheet. Bright blue cells are calculated based on the automatically filled in gray blue cells.

Year:	#N/D

IRRIGATED AGRICULTURE WATER USE EFFICIENCY (Awe)			UNIT	CALCULATION RULES
Ratio between rainfed and irrigated yields	[1]	0.000	decimals	AQUASTAT data (below) used if no data is entered
Proportion of irrigated land on the total arable land (Ai)	[2]	#N/D	decimals	=[3]/[4]
Irrigated land	[3]	#N/D	1000 ha	
Cultivated land	[4]	#N/D	1000 ha	
Proportion of agricultural GVA produced by rainfed agriculture (Cr)	[5]	#N/D	decimals	=(1/(1+([2]/((1-[2])*[1]))))
Gross value added by agriculture (excluding river and marine fisheries and forestry)	[6]	#N/D	USD (2015 price)	
Volume of water used by the agricultural sector (including irrigation, livestock and aquaculture)	[7]	#N/D	10^9 m^3	
Irrigated Agriculture Water Use Efficiency	[8]	#N/D	USD/m^3	=([7]*(1-[5]))/([6]*1000000000)
MIMEC WATER USE EFFICIENCY (Mwe)				
Gross value added by MIMEC sector (including energy)	[9]	#N/D	USD (2015 price)	
Volume of water used by the MIMEC sector (including energy)	[10]	#N/D	10^9 m^3	
MIMEC sector Water Use Efficiency	[11]	#N/D	USD/m^3	=[9]/([10]*1000000000)
SERVICES WATER USE EFFICIENCY (Swe)				
Gross value added by services	[12]	#N/D	USD (2015 price)	
Volume of water used by the services	[13]	#N/D	10^9 m^3	
Services Water Use Efficiency	[14]	#N/D	USD/m^3	=[12]/([13]*1000000000)
SERVICES WATER USE EFFICIENCY (Swe)				
Proportion of water used by the agricultural sector over the total water use	[15]	#N/D	decimals	=[6]/([6]+[10]+[13])
Proportion of water used by the MIMEC sector over the total water use	[16]	#N/D	decimals	=[10]/([6]+[10]+[13])
Proportion of water used by the service sector over the total water use	[16]	#N/D	decimals	=[13]/([6]+[10]+[13])
Water Use Efficiency	[17]	#N/D	USD/m^3	=[12]/([13]*1000000000)

Additional data used in the computation of the SDG 6.4.2:

Source	Variable	Unit	2019	2020	2021
UNSD	Agriculture, value added to GDP	US$ current	0	0	0
	Industry, value added to GDP (MIMEC)	US$ current	0	0	0
	Services, value added to GDP	US$ current	0	0	0
FAOSTAT	GDP Deflator (2015)	-	0	0	
	Cultivated land (Arable land + Permanent crop)	1000 ha	0	0	0
AQUASTAT	Ratio between rainfed and irrigated yields	%			0.000

SDG INDICATOR 6.4.2 ON WATER STRESS - COMPUTATION (in %)

This worksheet is a tool to automatically calculate the SDG indicator 6.4.1 on water use efficiency. Please do not touch: no compilation is required. It is automatically filled in based on the data you provided in the "National Data" worksheet and some additional data (see table below). If the indicator is not calculated, too many variables are missing: please check if you can fill in more variables in the "National data" worksheet. Bright blue cells are calculated based on the automatically filled in gray blue cells.

Year:	#N/D

WATER STRESS			UNIT	CALCULATION RULES
Total freshwater withdrawal (surface + groundwater)	[1]	**#N/D**	10^9 m^3	=[2]-[3]-[4]-[5] if missing from "National data"
Total water withdrawal	[2]	#N/D	10^9 m^3	**#N/D**
Desalinated water produced	[3]	#N/D	10^9 m^3	
Direct use of treated municipal wastewater	[4]	#N/D	10^9 m^3	
Direct use of agricultural drainage water	[5]	#N/D	10^9 m^3	
Total renewable freshwater resources	[6]	**0.000**	10^9 m^3	AQUASTAT data (below) used if no data is entered
Environmental flow requirements (volume)	[7]	**0.000**	10^9 m^3	FAO-IMWI data (below) used if no data is entered
Water Stress	[8]	**#N/D**	%	=[1]/([6]-([7]/100))

Additional data used in the computation of the SDG 6.4.2:

Source	Variable	Unit	2019	2020	2021
AQUASTAT	Total renewable freshwater resources	10^9 m^3/yr			0
FAO & IWM	Environmental flow requirements	10^9 m^3/yr			0

Annex 4. Analytical framework for SDG Target 6.4's gender contextualization

Two sets of gender indicators – basic and advanced – were included in the analytical framework developed under the work of SDG Target 6.4's gender contextualization. All indicators/parameters are categorized into themes and sub-themes under each thematic area as defined in the Conceptual map, showing possible connections (logical pathways) of gender equality in different water management and governance circumstances. Both frameworks share similar structures, indicating logical pathways, proposed gender-sensitive indicators/parameters for Indicators 6.4.1 and 6.4.2, the recommended scale of monitoring and reporting, and degrees of relevance to both SDG indicators and the target audience. The indicators/parameters listed in the basic set are primarily available in open-source databases such as that of the World Bank or the UN Women's SDG Dashboard. However, the expanded framework (not shown here) offers additional recommended indicators/parameters which are at present partially or wholly available, but which would provide a more comprehensive understanding of the gender dynamics of the indicators.

Analytical framework: basic set of gender indicators

Degrees of relevance to each indicator/parameter

Direct linkages to changes in water-use efficiency and water stress or scarcity

Partial linkages to changes in water-use efficiency and water stress or scarcity

Indirect linkages to changes in water-use efficiency and water stress or scarcity

Theme	Sub-theme	Connection with 6.4.1	Connection with 6.4.2	Indicators/ parameters	Level	Relevance to 6.4.1	Relevance to 6.4.2	Source	Target audience
A. Access and Control									
Economic empowerment	Land ownership and land title	• Access to land can increase access to water resources and options for productive and efficient use of resources with the link to direct access to food production link). • Women typically control less land – often of poorer quality – than men, and are less likely than men to use modern inputs such as improved seeds, pest control measures, and mechanical tools. • In some contexts, land ownership may not guarantee the right to water allocation. However, women's access to land/land rights can increase their capacity to participate in irrigation management.	• An increase in land access can also increase access to water resources. • More women participate in irrigation management through their access to land, enhancing sustainable water management and mitigating water scarcity impacts. • On the other hand, men tend to have more access to better-quality land. • They may thus increase pressures on land degradation and water scarcity on a larger scale if they do not manage water and land in sustainable ways. • In some contexts, land ownership may not guarantee the right to water allocation; however, women's access to land/land rights can increase their capacity to participate in irrigation management.	1. Proportion of people with secure tenure rights to land out of total adult population, by sex (%) (SDG 1.4.2).	Country			SDG Dashboard UN Women	Department of Land and Resources, National Statistics Authority
				2. Proportion of people with legally recognized documentation of their rights to land out of total adult population, by sex (%) (SDG 1.4.2).	Country			SDG Dashboard UN Women	Department of Land and Resources, National Statistics Authority
				3. Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure (SDG 5.a1).	Country			SDG Dashboard UN Women	Ministry of Agriculture, National Statistics Authority
				4. Share of women among owners or rights-bearers of agricultural land, by type of tenure (SDG 5.a.1 b).	Country			SDG Dashboard UN Women	Department of Land and Resources, National Statistics Authority
				5. Land titles owned by women, percentage of agricultural holdings headed by women.	Country			OECD	Department of Land and Resources, National Statistics Authority
	Crops and other agricultural activities	• Women and men have different degrees of access to land and crop patterns. • Men prefer cash crops, while women's preference is for food crops for consumption that require watering at a different time than the (main) staple crop cultivated by men or communally. • Decisions on the irrigation system are largely taken by men. • By addressing women's and men's specific water needs, women can improve household food security and agricultural productivity.	• Women and men have different degrees of access to land and crop patterns. • Men prefer cash crops, while women's preference is for food crops for consumption that require watering at a different time than the (main) staple crop cultivated by men or communally. • Decisions on the irrigation system are largely taken by men. • By addressing women's and men's specific water needs, women can mitigate the negative consequences resulting from water scarcity.	6. Average income of small-scale food producers, by sex and indigenous status (SDG 2.3.2).	Country			FAOSTAT	Department of Land and Resources, National Statistics Authority, Ministry of Women and Child Affairs
	Accessibility to water, water tenure rights, and water permits	• Access to water resources (ease of accessibility, water supply reliability, water rights, water permits) will increase women's rights and say on water allocation. • Access also increases the option of productively using water resources (including income generation).	• Women's rights to community water resources can enable women's participation in decision-making on water resource management, enhancing sustainable water management practices, and mitigating water scarcity impact.	7. Women's rights to community waters (countries' abilities to support women in exercising control over community water resources, for example national laws recognize women's rights to participate in community level governance).	Local			Whose Water Project, Rights and Resources Initiative (RRI) & Environmental Law Institute (ELI)	Ministry of Natural Resource Management, Academics, Non-Governmental Organizations (NGOs)
				8. Percentage of agricultural holdings with irrigation managed by women.	Country			AQUASTAT	Irrigation Department, NGOs
				9. Percentage of the area equipped for irrigation managed by women.	Country			AQUASTAT	Irrigation Department, NGOs

Theme	Sub-theme	Connection with 6.4.1	Connection with 6.4.2	Indicators/ parameters	Level	Relevance to		Source	Target audience
						6.4.1	6.4.2		
Knowledge and perception	Extension service	• Access to training opportunities allows women to gain more knowledge of modern technologies and practices, thus increasing the likely adoption of marketable farming and water-related businesses.	• Access to information results in increasing knowledge of environmental management, including water conservation practices and how to mitigate the impacts of water scarcity.	10. Percentage of women's participation in extension services.	Local			Farmer Innovation Fund Impact Evaluation 2012, Midline Survey - Ethiopia, 2012 (World Bank)	Ministry of Agriculture, National Statistics Authority, NGOs
	Higher education in Science, Technology, Engineering and Mathematics (STEM) and agriculture	• Access to knowledge and technology provides an opportunity to gain more technical expertise in improving WUE and increasing productivity.	• Access to knowledge and technology allows women to gain more technical knowledge to improve mitigation solutions for WS/water scarcity.	11. Female share of graduates from STEM programmes, tertiary (%).	Country			Gender Data Portal – World Bank/ International Labour Organization (ILO)	Ministry of Education, National Statistics
				12. Female share of graduates in Agriculture, Forestry, Fisheries and Veterinary programmes, tertiary (%).	Country			Gender Data Portal – World Bank /ILO	Ministry of Education, National Statistics
	Perception of law	• Access to knowledge of land rights provides an understanding of water rights which will help marginalized people to negotiate rights to manage water resources.	• Access to knowledge of land rights provides an understanding of water rights which will help marginalized people to negotiate rights to manage water resources.	13. Women's perceptions, legal knowledge (legal knowledge specific to *mailo*[3] land through scenario-based questions and hypothetical examples).	Local			Impact Evaluation of the Improvement of Land Governance to Increase Productivity of Small-Scale Farmers on Mailo-Land 2017, Uganda (World Bank)	Ministry of Agriculture, Authority, NGOs
Financial services	Credit	• Access to resources such as land, water, fertilizers, and technology can improve productive capacity, education, market access, and income generation. • Having access to those resources also increases decision-making power and confidence, resulting in more significant roles in water project meetings/public activities.	• Access to resources such as land, water, fertilizers, and technology can improve productive capacity, education, market access, and income generation. • Having access to those resources also increases decision-making power and confidence, resulting in more significant roles in water (scarcity) project meetings/ public activities.	14. Access to and decisions on financial services.	Local			Women's Empowerment in Agriculture Index (pro-WEAI), International Food Policy Research Institute (IFPRI)	Academic, NGOs
Technology	Access to mobile phones	• Access to relevant data tools for monitoring and communicating for water management at individual and collective levels offers the potential to expand production and use water resources in the agricultural sector more efficiently.	• Access to information allows people to access knowledge and information related to water and form groups – both formal and informal – which can advocate for their rights and improve access to water resources and lands.	15. Proportion of individuals who own a mobile telephone, by sex (SDG 5.b.1).	Country			SDG Dashboard UN Women	National Statistics

3 *Mailo* refers to one of the land tenure systems in Uganda, established in the 1900s. It is estimated that approximately 10 percent of Uganda's land is held under mailo tenure. This continues to be governed by Buganda law and custom, including land being passed exclusively to male descendants (Ali and Duponchel, 2018).

Theme	Sub-theme	Connection with 6.4.1	Connection with 6.4.2	Indicators/ parameters	Level	Relevance to 6.4.1	Relevance to 6.4.2	Source	Target audience
B. Voice, Agency and Participation									
Decision-making	Fundamental decisions – reproductive health, mobility and finance	• The ability to make decisions at household level encourages women to use their voice at intra- and inter-household levels. • It empowers other women to be actively involved through formal and informal groups. • Women gaining confidence and acting with agency can result in meaningful participation in water-related projects in which they can contribute their knowledge to enhance agricultural inputs and access to water allocation.	• The ability to make decisions at household level encourages women to use their voice at intra- and inter-household levels. • It empowers other women to be actively involved through formal and informal groups. • Women gaining confidence and acting with agency can result in meaningful participation in water management and water-related projects designed to mitigate water scarcity.	16. Married women participating in decisions on three levels (their own health care, major household purchases, and visits to family or relatives).	Country			United States Agency for International Development (USAID): Demographic and Health Surveys (DHS) survey	Ministry of Women and Child Affairs, National Statistics Authority
	Agricultural inputs	• Women's knowledge and skills can increase agricultural production and water-use efficiency.	• Women's knowledge and skills can lead them to be part of strategies to tackle water shortage/scarcity impacts.	17. Percentage of women's inputs in productive decisions.	Local			Women's Empowerment in Agriculture Index (pro-WEAI), International Food Policy Research Institute (IFPRI)	Ministry of Agriculture, Authority, NGOs, Academic
	Social capital	• Active participation in social capital in the form of groups and engagement in off-farm and on-farm activities can stimulate/ facilitate women's participation in crop production activities.	• Accessibility to social capital in the form of groups and engagement in off-farm activities stimulates women's participation in water management, contributing solutions and strategies to water shortage/ scarcity impacts.	18. Decision-making, bargaining, and women's social capital (involvement and belonging to groups such as religious, farmers, cooperatives, and the frequency of involvement in such groups). It also covers decision-making on a number of household levels).	Local			Impact Evaluation of the Improvement of Land Governance to Increase Productivity of Small-Scale Farmers on Mailo-Land 2017, Uganda (World Bank)	Ministry of Agriculture, Authority, NGOs, Academic
	Water-related projects (irrigation and water resource management)	• Involving women in informed decision-making on irrigation projects can help address women's specific needs in water use and contribute knowledge in water resource management.	• Involving women in informed deci-sion-making on irrigation projects enables women to be part of sustainable WS/water scarcity solutions. • It increases understanding gained from using technology and increases awareness, resulting in meaningful participation and more effective decision-making.	19. Percentage of female and male farmers reporting participating to some degree in decision-making on irrigation projects.	Local			Adapted from Climate-Smart Monitoring Framework - Tackling uptake of CSA options and perceived outcomes at household and farm level by CGIAR	Irrigation Department, NGOs, Academic
Agency	Group membership	• Group membership can create individual and collective agency and empower women through access to information, resources, and connections with others, improving their access to water and land, credit, and other resources.	• Group membership can create individual and collective agency and empower women through new access to information, resources, and connections with others, thus improving their access to water and land, credit, and other resources, and participate in solutions and strategies for water shortage/scarcity impacts.	20. Membership in influential groups.	Local			Women's Empowerment in Agriculture Index (pro-WEAI), International Food Policy Research Institute (IFPRI)	NGOs, Academic, International Organization
	Respect from others	• Respect among household members is considered as an intrinsic agency ("power within"), increasing self-esteem, raising awareness and consciousness, and building confidence. • As a result, women confidently participate in activities at intra-and inter-household levels, including water-related projects.	• Respect among household members is considered as an intrinsic agency ("power within"), increasing self-esteem, raising awareness and building confidence and consciousness. As a result, women confidently participate in activities at intra-and inter-household levels which can include water-related projects (solutions to water scarcity).	21. Respect among household members.	Local			Women's Empowerment in Agriculture Index (pro-WEAI), International Food Policy Research Institute (IFPRI)	NGOs, Academic, International Organization

Theme	Sub-theme	Connection with 6.4.1	Connection with 6.4.2	Indicators/ parameters	Level	Relevance to 6.4.1	Relevance to 6.4.2	Source	Target audience
Participation	Employment	• Women participate in employment in water-related sectors, contributing their knowledge and skills, benefitting water utilities and use.	• Women participate in employment in water-related sectors, contributing their knowledge and skills, which can help generate solutions for water shortage/ scarcity, including gender-specific needs.	22. Employment in agriculture, female (percentage of female employment) (modelled International Labour Organization [ILO] estimate).	Country			Gender Data Portal – World Bank/ILO	Department of Labour and Employment, National Statistics Authority
				23. Employment in industry, female (percentage of female employment) (modelled ILO estimate).	Country			Gender Data Portal – World Bank/ILO	Department of Labour and Employment, National Statistics Authority
				24. Employment in services, female (percentage of female employment) (modelled ILO estimate).	Country			Gender Data Portal – World Bank/ILO	Department of Labour and Employment, National Statistics Authority
	Managerial and leadership positions	• Women in managerial positions can increase their participation in important decision-making opportunities in the water sector. • Equal access to parliament can be a crucial driver of women's opportunities in political and public life, gender equality rights, water, and land rights that are gender-sensitive, enabling them to manage natural resources, including water resource management, which can address their specific needs and improve WUE	• Women in managerial positions can increase their contribution to finding sustainable water solutions and knowledge-building on water resource management. • Equal access to parliament can be a crucial aspect of women's opportunities in political and public life, gender equality rights, water and land rights that are gender-sensitive, enabling them to manage natural resources, including water management, which can address women's specific needs, mitigate negative impacts from WS/water scarcity and protect water resources.	25. Firms with female top management (percentage of firms).	Country			Gender Data Portal – World Bank/ILO	Department of Labour and Employment, National Statistics Authority
				26. Firms with female participation in ownership (percentage of firms).	Country			Gender Data Portal – World Bank/ILO	Department of Labour and Employment, National Statistics Authority
				27. Proportion of seats held by women in (a) national parliaments (SDG 5.5.1a).	Country			SDG Dashboard UN Women	National Statistics Authority
				28. Proportion of seats held by women in (b) local governments (SDG 5.5.1b).	Country			SDG Dashboard UN Women	National Statistics Authority, Ministry of Women and Child Affairs
C. Enabling Environment									
Integration of gender mainstreaming	Gender-specific objectives and measures	• Taking gender concerns into account in policy formulation can enable women's participation in water-related issues and create equity and equality in water and sanitation management.	• Taking gender concerns into account in policy formulation can enable women's participation in water-related issues and reduce the number of people suffering from water scarcity.	29. Degree of implementation of gender-specific objectives for water resource management.	Country			Africa Water Sector and Sanitation Monitoring and Reporting	Ministry of Natural Resource Management, Ministry of Agriculture, Ministry of Women and Child Affairs
				30. Percentage of countries with measures targeting vulnerable groups for sanitation: (i) in policies and plans; (ii) monitoring service provision; and, (iii) financing plans, which are then consistently applied.	Country			UN-Water Global Analysis and Assessment of Sanitation and Drinking Water (GLASS)	Ministry of Women and Child Affairs, Ministry of Public Health, Academic

Theme	Sub-theme	Connection with 6.4.1	Connection with 6.4.2	Indicators/ parameters	Level	Relevance to		Source	Target audience
						6.4.1	6.4.2		
Gender-responsive laws	Laws and regulations affect women's economic opportunity, including the anti-domestic violence act, workplace, mobility, entrepreneurship, and asset ownership	• Law enforcement affects women's decisions and participation at all levels. • Gender-responsive laws can encourage and enable women's participation in decision-making related to lands and water.	• Law enforcement affects women's decisions and participation at all levels. • Gender-responsive laws can encourage and enable women's participation in decision-making related to WS solutions.	31. Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex (SDG 5.1.1).	Country			SDG Dashboard UN Women	Ministry of Women and Child Affairs
				32. Proportion of countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control (SDG 5.a.2).	Country			SDG Dashboard UN Women	Ministry of Women and Child Affairs
				33. Domestic violence legislation.	Country			Progress of the World's Women	Ministry of Justice, Ministry of Women and Child Affairs
				34. Women, business and the law: index score.	Country			Women, Business & the Law – World Bank	Ministry of Justice, Ministry of Women and Child Affairs
				35. Women, Business and the Law (WBL): mobility.	Country			Women, Business & the Law – World Bank	Ministry of Justice, Ministry of Women and Child Affairs
				36. WBL: asset.	Country			Women, Business & the Law – World Bank	Ministry of Justice, Ministry of Women and Child Affairs
				37. WBL: workplace.	Country			Women, Business & the Law – World Bank	Ministry of Justice, Ministry of Women and Child Affairs
				38. WBL: pay.	Country			Women, Business & the Law – World Bank	Ministry of Justice, Ministry of Women and Child Affairs
				39. WBL: entrepreneurship.	Country			Women, Business & the Law – World Bank	Ministry of Justice, Ministry of Women and Child Affairs
Tracking public allocations system	Fiscal system monitoring	• Adequate quantity or quality of finance allocated for gender equality and women's empowerment enables the implementation of gender-responsive laws and policies such as women's participation.	• Adequate quantity or quality of finance allocated for gender equality and women's empowerment enables the implementation of gender-responsive laws and policies such as women's participation.	40. Proportion of countries with systems to track and make public allocations for gender equality and women's empowerment (SDG 5.c.1).	Country			SDG Dashboard UN Women	Ministry of Women and Child Affairs

Theme	Sub-theme	Connection with 6.4.1	Connection with 6.4.2	Indicators/ parameters	Level	Relevance to 6.4.1	Relevance to 6.4.2	Source	Target audience
D. Gender-specific impacts									
Mortality and negative health impacts	Mortality and negative health impacts	• Negative health impacts from diseases associated with water limit ability; to be active in decision-making activities at intra-and inter-household levels, including natural resource management.	• Women, girls, and newborns are at risk of unsafe water and inadequate sanitation facilities when they face water scarcity, resulting in more demand for care and low water quality for menstrual hygiene management.	41. Mortality rate attributed to unsafe water, unsafe sanitation and lack of female hygiene (per 100 000 female population).	Country			Gender Data Portal – World Bank	National Statistics Authority, Ministry of Public Health
				42. Maternal mortality ratio (modelled estimate, per 100 000 live births).	Country			Gender Data Portal – World Bank	National Statistics Authority, Ministry of Public Health
				43. Mortality rate, infant (per 1000 live births).	Country			Gender Data Portal – World Bank	National Statistics Authority, Ministry of Public Health
Expenditure of time	Fetching water	• Limited education and economic opportunities adversely affect the chance to gain knowledge and productive activity. • Lack of education opportunities results in inability to engage in income-generating. • Having adequate knowledge and education in water-related business can improve the productivity of an existing water-related business/activity and natural resource management.	• Women's and girls'/children's roles are often assigned to ensure household water supply without infrastructure. • Walking for longer distances due to water scarcity/depletion of resources is likely to increase the risk of sexual violence, diseases, injuries, and economic opportunity loss.	44. Percentage of households with women water carriers.	Local			Water Poverty Index	National Statistics Authority, Ministry of Public Health
				45. Percentage of households with water a 30-minute round trip or more away.	Local/Country			Water Poverty Index (Local level) USAID: DHS Survey (Country level)	National Statistics, District/Provincial Administrative Organization, Provincial Waterworks Authority, NGOs
				46. Average volume per trip (litres).	Local			Water Poverty Index	National Statistics, District/Provincial Administrative Organization, Provincial Waterworks Authority, NGOs
				47. Average number of trips per person per day.	Local			Water Poverty Index	National Statistics, District/Provincial Administrative Organization, Provincial Waterworks Authority, NGOs
	Unpaid domestic work	• Limited education and economic opportunity adversely affect chances to gain knowledge and productive activity. • A lack of education opportunities results in an inability to generate income. • Having adequate knowledge and education in a water-related business can improve the productivity of an existing water-related business/activity and natural resource management.	• Women's and girls'/children's roles are often assigned to ensure the household water supply without infrastructure. • Walking longer distances due to water scarcity/depletion of resources is likely to increase the risk of sexual violence, diseases, injuries, and economic opportunity loss.	48. Proportion of time spent on unpaid domestic chores and care work, by sex, age and location (percentages) (SDG 5.4.1).	Country			SDG Dashboard UN Women	Ministry of Women and Child Affairs, National Statistics Authority
				49. Proportion of time spent on unpaid domestic and care work, female (percentage of 24-hour day).	Country			Gender Data Portal – World Bank	Ministry of Women and Child Affairs, National Statistics Authority

Annex 5. SDG Target 6.4 Indicators-related basic documents and information resources

- **SDG 6.4.1 and 6.4.2 support page (FAO/IMI-SDG6):**
  EN: https://www.fao.org/in-action/integrated-monitoring-initiative-sdg6/en
- **SDG 6.4.1 e-learning course** (available in AR | EN | FR | PT | RU | SP)
- **SDG 6.4.2 e-learning course** (available in AR | EN | FR | PT | RU | SP)
- **Environmental flows within SDG 6.4.2 – e-learning course** (available in EN | FR | SP)
- **SDG 6.4.1 statistics page** (available in AR, CN, EN, FR, RU, SP):
  EN: https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/641-change-in-water-use-efficiency-over-time/en
- **SDG 6.4.2 statistics page** (available in AR, CN, EN, FR, RU, SP):
  EN: https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/642-water-stress/en
- **SDG 6.4.1 metadata** (available in EN):
  EN: https://unstats.un.org/sdgs/metadata/files/Metadata-06-04-01.pdf
- **SDG 6.4.2 metadata** (available in AR, EN):
  EN: https://unstats.un.org/sdgs/metadata/files/Metadata-06-04-02.pdf
- **Step-by-step monitoring methodology for SDG 6.4.1** (available in AR | EN | FR | PT | RU | SP:
  EN: http://www.fao.org/3/ca8484en/ca8484en.pdf
- **Step-by-step monitoring methodology for SDG 6.4.2** (available in AR | EN | FR | PT | RU | SP):
  EN: http://www.fao.org/3/ca8483en/ca8483en.pdf
- **SDG 6.4 monitoring sustainable use of water resources papers. Guidelines for calculation of the agriculture water use efficiency for global reporting. The agronomic parameters in the SDG indicator 6.4.1: yield ratio and proportion of rainfed production** (available in AR | EN | FR | RU | SP):
  EN: https://doi.org/10.4060/cb8768en
- **SDG 6.4 monitoring sustainable use of water resources papers. Change in water-use efficiency over time (SDG indicator 6.4.1). Analysis and interpretation of preliminary results in key regions and countries** (available in EN):
  EN: https://www.fao.org/documents/card/en/c/ca5400en
- **SDG 6.4 monitoring sustainable use of water resources papers. Incorporating environmental flows into "water stress" indicator 6.4.2 - Guidelines for a minimum standard method for global reporting**
  (available in AR | EN | FR | PT | SP | RU):
  EN: https://www.fao.org/publications/card/en/c/CA3097EN/
- **SDG 6.4 monitoring sustainable use of water resources papers. Disaggregation of SDG 6.4.2 - country pilot of Italy** (available in EN):
  EN: https://www.fao.org/documents/card/en/c/CC5037EN
- **SDG 6.4 monitoring sustainable use of water resources papers. Disaggregation of water stress levels by river basin: Cap Matifou sub-basin, Algeria** (available in FR):
  FR: https://doi.org/10.4060/cc9424fr
- **SDG 6.4 monitoring sustainable use of water resources papers. Water stress plugin for Water Evaluation and Planning system (WEAP). Using the water evaluation and planning tool for the calculation of Sustainable Development Goal indicator 6.4.2** (available in EN | FR | SP):
  EN: https://doi.org/10.4060/cc7435en

- **SDG 6.4 monitoring sustainable use of water resources papers. Considerations on how SDG target 6.4 is reflected in Voluntary National Reviews** (available in EN):
  EN: https://doi.org/10.4060/cd1269en
- **Progress on Water-Use Efficiency – Global baseline for SDG indicator 6.4.1 – 2018**
  (available in AR | CN | EN | FR | RU | SP):
  EN: https://openknowledge.fao.org/handle/20.500.14283/ca1588en
- **Progress on Level of Water Stress – Global baseline for SDG indicator 6.4.2 – 2018**
  (available in AR | CN | EN | FR | RU | SP):
  EN: https://openknowledge.fao.org/handle/20.500.14283/ca1592en
- **Progress on Water-Use Efficiency – Global status and acceleration needs for SDG indicator 6.4.1 – 2021**
  (available in EN | AR | SP):
  EN: https://www.fao.org/documents/card/en/c/cb6413en
- **Progress on Level of Water Stress – Global status and acceleration needs for SDG indicator 6.4.2 – 2021**
  (available in EN | FR | RU | SP):
  EN: https://www.fao.org/documents/card/en/c/cb6241en
- **Thinking the Unthinkable: Harnessing the Pandemic to Improve SDG 6 Capacity Development** https://sdg.iisd.org/commentary/guest-articles/thinking-the-unthinkable-harnessing-the-pandemic-to-improve-sdg-6-capacity-development/
- **Assessing SDG indicator 6.4.2 'level of water stress' at major basins level**
  https://www.scienceopen.com/hosted-document?doi=10.14324/111.444/ucloe.000026

Learn more about progress towards SDG 6

Sustainable Development Goal (SDG) 6 expands the Millennium Development Goal (MDG) focus on drinking water and basic sanitation to include the more holistic management of water, wastewater and ecosystem resources, acknowledging the importance of an enabling environment. Bringing these aspects together is an initial step towards addressing sector fragmentation and enabling coherent and sustainable management. It is also a major step towards a sustainable water future.

Monitoring progress towards SDG 6 is key to achieving this SDG. High-quality data help policymakers and decision makers at all levels of government to identify challenges and opportunities, to set priorities for more effective and efficient implementation, to communicate progress and ensure accountability, and to generate political, public and private sector support for further investment.

The 2030 Agenda for Sustainable Development specifies that global follow-up and review shall primarily be based on national official data sources. The data are compiled and validated by the United Nations custodian agencies, who contact country focal points every two to three years with requests for new data, while also providing capacity-building support. The last global "data drive" took place in 2023, resulting in status updates on seven of the global indicators for SDG 6 (please see below). These reports provide a detailed analysis of current status, historical progress and acceleration needs regarding the SDG 6 targets.

To enable a comprehensive assessment and analysis of overall progress towards SDG 6, it is essential to bring together data on all the SDG 6 global indicators and other key social, economic and environmental parameters. This is exactly what the SDG 6 Data Portal does, enabling global, regional and national actors in various sectors to see the bigger picture, thus helping them make decisions that contribute to all SDGs. UN-Water also publishes synthesized reporting on overall progress towards SDG 6 on a regular basis.

Summary Brief: Mid-term status of SDG 6 global indicators and acceleration needs

Based on latest available data on all SDG 6 global indicators. Published by UN-Water through the UN-Water Integrated Monitoring Initiative for SDG 6.

Progress on household drinking water, sanitation and hygiene 2000–2022: special focus on gender

Based on latest available data on SDG indicators 6.1.1 and 6.2.1. Published by World Health Organization (WHO) and United Nations Children's Fund (UNICEF).

https://www.unwater.org/publications/who/unicef-joint-monitoring-program-update-report-2023

Progress on the proportion of domestic and industrial wastewater flows safely treated – Mid-term status of SDG Indicator 6.3.1 and acceleration needs, with a special focus on climate change, wastewater reuse and health

Based on latest available data on SDG indicator 6.3.1. Published by WHO and United Nations Human Settlements Programme (UN-Habitat) on behalf of UN-Water.

https://www.unwater.org/publications/progress-wastewater-treatment-2024-update

Progress on ambient water quality: Mid-term status of sdg indicator 6.3.2 and acceleration needs, with a special focus on health

Based on latest available data on SDG indicator 6.3.2. Published by United Nations Environment Programme (UNEP) on behalf of UN-Water.

Progress on change in water-use efficiency. Mid-term status of sdg indicator 6.4.1 and acceleration needs, with special focus on food security and climate change

Based on latest available data on SDG indicator 6.4.1. Published by Food and Agriculture Organization of the United Nations (FAO) on behalf of UN-Water.

Progress on the level of water stress. Mid-term status of the sdg indicator 6.4.2 and acceleration needs, with special focus on food security and climate change

Based on latest available data on SDG indicator 6.4.2. Published by FAO and UN-Water.

Progress on implementation of Integrated Water Resources Management. Mid-term status of SDG indicator 6.5.1 and acceleration needs, with a special focus on climate change

Based on latest available data on SDG indicator 6.5.1. Published by UNEP and UN-Water.

Progress on transboundary water cooperation. Mid-term status of SDG Indicator 6.5.2, with a special focus on climate change – 2024

Based on latest available data on SDG indicator 6.5.2. Published by United Nations Economic Commission for Europe (UNECE) and United Nations Educational, Scientific and Cultural Organization (UNESCO) on behalf of UN-Water.

Progress on water-related ecosystems. Mid-term status of sdg indicator 6.6.1 and acceleration needs, with a special focus on biodiversity

Based on latest available data on SDG indicator 6.6.1. Published by UNEP on behalf of UN-Water.

Strong systems and sound investments: evidence on and key insights into accelerating progress on sanitation, drinking-water and hygiene.

The UN-Water global analysis and assessment of sanitation and drinking-water (GLAAS) 2022 report

https://www.unwater.org/publications/un-water-glaas-2022-strong-systems-and-sound-investments-evidence-and-key-insights

Based on latest available data on SDG indicators 6.a.1 and 6.b.1. Published by WHO through the UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) on behalf of UN-Water.

UN-Water reports and other relevant publications

UN-Water coordinates the efforts of United Nations entities and international organizations working on water and sanitation issues. UN-Water publications draw on the experience and expertise of UN-Water's Members and Partners.

United Nations System-Wide Strategy for Water and Sanitation

The United Nations system-wide strategy for water provides a system-wide approach for the United Nations to work collaboratively on water and sanitation. In September 2023, Member States adopted General Assembly resolution 77/334, which requested the Secretary-General to present a United Nations system-wide water and sanitation strategy in consultation with Member States before the end of the seventy-eighth session. The strategy has been developed by UN-Water under the leadership of the UN-Water Chair, as requested by the Secretary-General, and will be launched in July 2024.

Blueprint for Acceleration: Sustainable Development Goal 6 Synthesis Report on Water and Sanitation 2023

The report, written by the UN-Water family of Members and Partners, is a concise guide to delivering concrete results – offering actionable policy recommendations directed towards senior decision-makers in Member States, other stakeholders, and the United Nations System to get the world on track to achieve SDG 6 by 2030. It was released ahead of the discussions of Member States and relevant stakeholders at the 2023 High-level Political Forum on Sustainable Development (HLPF), which includes a Special Event focused on SDG 6 and the Water Action Agenda.

United Nations World Water Development Report

The United Nations World Water Development Report is UN-Water's flagship report on water and sanitation issues, focusing on a different theme each year. The report is published by UNESCO on behalf of UN-Water, and its production is coordinated by the UNESCO World Water Assessment Programme.

SDG 6 Progress Update – 9 reports, by SDG 6 global indicator

This series of reports provides an in-depth update and analysis of progress towards the different SDG 6 targets and identifies priority areas for acceleration. *Progress on household drinking water, sanitation and hygiene, Progress on wastewater treatment, Progress on ambient water quality, Progress on water-use efficiency, Progress on level of water stress, Progress on integrated water resources management, Progress on transboundary water cooperation, Progress on water-related ecosystems and Progress on international cooperation and local participation*. The reports, produced by the responsible custodian agencies, present the latest available country, region and global data on the SDG 6 global indicators, and are published every two to three years.

Progress reports of the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP)

The JMP is affiliated with UN-Water and is responsible for global monitoring of progress towards SDG 6 targets for universal access to safe and affordable drinking-water and adequate and equitable sanitation and hygiene services. Every 2 years, the JMP releases updated estimates and progress reports for WASH in households (as part of the progress reporting on SDG 6, see above), schools and health care facilities.

UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS)

The GLAAS report is produced by WHO on behalf of UN-Water. It provides a global update on the policy frameworks, institutional arrangements, human resource base, and international and national finance streams in support of water and sanitation. It is a substantive input into the activities of Sanitation and Water for All as well as the progress reporting on SDG 6. The next report will be published in 2025.

UN-Water Country Acceleration Case Studies

To accelerate the achievement of SDG 6 targets as part of the SDG 6 Global Acceleration Framework, UN-Water releases SDG 6 Country Acceleration Case Studies to explore countries' pathways to achieving accelerated progress on SDG 6 at the national level. Since 2022, six case studies have been released from Costa Rica, Pakistan. Senegal, Brazil, Ghana and Singapore. Three new are planned to be released in July 2024 from Cambodia, Czechia and Jordan.

Policy and Analytical Briefs

UN-Water's Policy Briefs provide short and informative policy guidance on the most pressing freshwater-related issues that draw upon the combined expertise of the United Nations system. Analytical Briefs provide an analysis of emerging issues and may serve as basis for further research, discussion and future policy guidance.

UN-Water Planned Publications

- UN-Water Policy Brief on Transboundary Waters Cooperation – update

More information: https://www.unwater.org/unwater-publications/

How is the world doing on Sustinable Development Goal 6?
View, analyze and download global, regional and national water and sanitation data

http://www.sdg6data.org/

The global indicator on water stress tracks the level of pressure that human activities exert over natural freshwater resources, indicating the environmental sustainability of the use of water resources. A high level of water stress has negative effects on social and economic development, increasing competition and potential conflict among users. This calls for effective supply and demand management policies. Securing environmental flow requirements is essential to maintaining ecosystem health, resilient and available for future generations.

This indicator addresses the environmental component of target 6.4. In this report, you can learn more about the progress on the level water stress globally, by country and by major basin.

More information and methodological guidance can be found at:
https://www.fao.org/in-action/integrated-monitoring-initiative-sdg6/resources-support/en

and https://www.fao.org/aquastat/en/

This report is part of a series that tracks progress towards the various targets set out in SDG 6 using the SDG global indicators. To learn more about water and sanitation in the 2030 Agenda for Sustainable Development, and the Integrated Monitoring Initiative for SDG 6, visit our website:
http://www.sdg6monitoring.org

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