Food and Agriculture Organization of the United Nations

6 CLEAN WATER AND SANITATION

Progress on Level of Water Stress

Global baseline for SDG indicator 6.4.2

2018

UN WATER

Progress on Level of Water Stress

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UN WATER

Presenting the UN-Water Integrated Monitoring Initiative for SDG 6

Through the UN-Water Integrated Monitoring Initiative for Sustainable Development Goal (SDG) 6, 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.

The Initiative brings together the United Nations organizations that are formally mandated to compile country data on the SDG 6 global indicators, who organize their work within three complementary initiatives:

- **WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP)**[1]

  Building on its 15 years of experience from Millennium Development Goals (MDG) monitoring, the JMP looks after the drinking water, sanitation and hygiene aspects of SDG 6 (targets 6.1 and 6.2).

- **Integrated Monitoring of Water and Sanitation-Related SDG Targets (GEMI)**[2]

  GEMI was established in 2014 to harmonize and expand existing monitoring efforts focused on water, wastewater and ecosystem resources (targets 6.3 to 6.6).

- **UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS)**[3]

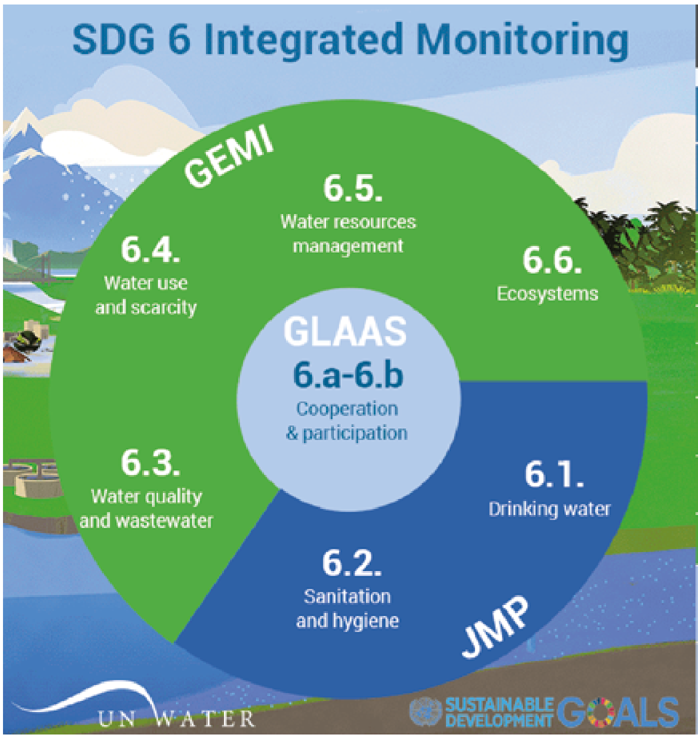
  The means of implementing SDG 6 (targets 6.a and 6.b) fall under the remit of GLAAS, which monitors the inputs and the enabling environment required to sustain and develop water and sanitation systems and services.

The objectives of the Integrated Monitoring Initiative are to:

- Develop methodologies and tools to monitor SDG 6 global indicators
- Raise awareness at the national and global levels about SDG 6 monitoring
- Enhance technical and institutional country capacity for monitoring
- Compile country data and report on global progress towards SDG 6

The joint effort around SDG 6 is especially important in terms of the institutional aspects of monitoring, including the integration of data collection and analysis across sectors, regions and administrative levels.

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: www.sdg6monitoring.org



INDICATORS	CUSTODIANS
6.1.1 Proportion of population using safely managed drinking water services	WHO, UNICEF
6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water	WHO, UNICEF
6.3.1 Proportion of wastewater safely treated	WHO, UN-Habitat, UNSD
6.3.2 Proportion of bodies of water with good ambient water quality	UN Environment
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 implementation (0-100)	UN Environment
6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	UNESCO, UNECE
6.6.1 Change in the extent of water-related ecosystems over time	UN Environment, Ramsar
6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	WHO, UN Environment, 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, UN Environment, OECD

[1] http://www.sdg6monitoring.org/about/components/jmp/
[2] http://www.sdg6monitoring.org/about/components/presenting-gemi/
[3] http://www.sdg6monitoring.org/about/components/glaas/

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Elijah Yoursee, a farmer in Paynesville, Liberia, waters a rice field. Photo: Albert Gonzalez Farran/UNMIL

FOREWORD

Water is the lifeblood of ecosystems, vital to human health and well-being and a precondition for economic prosperity. That is why it is at the very core of the 2030 Agenda for Sustainable Development. Sustainable Development Goal 6 (SDG 6), the availability and sustainable management of water and sanitation for all, has strong links to all of the other SDGs.

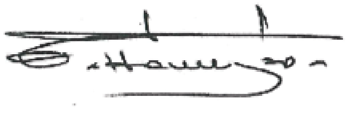
In this series of progress reports under the UN-Water Integrated Monitoring Initiative for SDG 6, we evaluate progress towards this vital goal. The United Nations organizations are working together to help countries monitor water and sanitation across sectors and compile data so that we can report on global progress.

SDG 6 expands the Millennium Development Goal focus on drinking water and basic sanitation to include the management of water and wastewater and ecosystems, across boundaries of all kinds. Bringing these aspects together is an essential first step towards breaking down sector fragmentation and enabling coherent and sustainable management, and hence towards a future where water use is sustainable.

This report is part of a series that track progress towards the various targets set out in SDG 6 using the SDG global indicators. The reports are based on country data, compiled and verified by the responsible United Nations organizations, and sometimes complemented by data from other sources. The main beneficiaries of better data are countries. The 2030 Agenda specifies that global follow-up and review "will be primarily based on national official data sources", so we sorely need stronger national statistical systems. This will involve developing technical and institutional capacity and infrastructure for more effective monitoring.

To review overall progress towards SDG 6 and identify interlinkages and ways to accelerate progress, UN-Water produced the SDG 6 Synthesis Report 2018 on Water and Sanitation. It concluded that the world is not on track to achieve SDG 6 by 2030. This finding was discussed by Member States during the High-level Political Forum on Sustainable Development (HLPF) in July 2018. Delegates sounded the alarm about declining official development aid to the water sector and stressed the need for finance, high-level political support, leadership and enhanced collaboration within and across countries if SDG 6 and its targets are to be met.

To achieve SDG 6, we need to monitor and report progress. This will help decision makers identify and prioritize what, when and where interventions are needed to improve implementation. Information on progress is also essential to ensure accountability and generate political, public and private sector support for investment. The UN-Water Integrated Monitoring Initiative for SDG 6 is an essential element of the United Nations' determination to ensure the availability and sustainable management of water and sanitation for all by 2030.



Gilbert F. Houngbo
UN-Water Chair and President of the International Fund for Agricultural Development

FOREWORD

It is my pleasure to present this report, which sets the baseline for monitoring indicator 6.4.2 – Level of water stress – in the context of the Sustainable Development Goals (SDGs) global report.

Since few countries have the natural and financial resources to continue increasing water supplies as demand increases, better, more efficient and more productive use of water resources is essential for our future and the future of the planet. This report addresses the importance of reducing water stress, which is a measure of the pressure that human activities exert on natural freshwater resources, providing an indication of the environmental sustainability of the use of water resources.

Water stress is defined as the proportion of water withdrawal by all sectors in relation to the available water resources. The global average for this proportion is 13 per cent. Water stress affects every continent, hinders sustainability and limits social and economic development. More than 2 billion people live in countries experiencing high water stress. Although the global average water stress is only 13 per cent, 32 countries experience water stress between 25 per cent (when stress begins) and 70 per cent, and 22 countries are above 70 per cent and considered seriously stressed.

While agriculture remains by far the largest water user, accounting for nearly 70 per cent of all water withdrawals globally, its share in the overall sectoral distribution is decreasing. This indicates that other uses are growing and that sustainability in the use and management of water resources requires a collective and coordinated effort among all the actors involved. Alternative water sources such as wastewater, storm run-off and desalination, as well as measures such as water harvesting, can help relieve water stress. Safe wastewater reuse and recycling is a significantly untapped resource for industry and agriculture, but its use must overcome political and cultural barriers.

One of the key premises of the 2030 Agenda for Sustainable Development is “leaving no one behind”. To achieve this, the interlinkages between its 17 SDGs need to be well understood and appropriate actions undertaken for the benefit of all, including addressing socioeconomic and gender inequalities.

Within this framework, SDG target 6.4 is particularly relevant as it focuses on ensuring that water resources are sufficient for all users, and that such availability is the outcome of a deliberate management of these resources. The Food and Agriculture Organization (FAO), in coordination with other United Nations agencies through UN-Water, supports countries in implementing this target, through direct actions in the agricultural and environmental fields and by supporting the assessment of progress towards achieving it.

To this end, FAO has joined the Integrated Monitoring Initiative, which has gathered experiences and resources aimed at ensuring a coherent monitoring framework for water and sanitation by 2030. Such a framework will help countries achieve progress through well-informed decision-making on water, based on harmonized, comprehensive, timely and accurate information.

More data, enabling a disaggregated analysis of the pattern of water use at the basin level, will be needed to provide better insights for decision makers, both at the global and the country level.

FAO, predominantly through its AQUASTAT database, remains committed to improving the quality and quantity of data produced and analysed, in close partnership with the relevant authorities of our Member States. This report is an important step towards a more widespread and operational knowledge of the status of water resources and the sustainability of their use.

René Castro-Salazar

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EXECUTIVE SUMMARY

Access to safe water and sanitation and sound management of freshwater ecosystems are at the very core of sustainable development. This is the objective set by Sustainable Development Goal 6 (SDG 6), which further enhances Millennium Development Goal 7 (MDG 7) by including water management approaches and elements, such as integrated water resources management, wastewater treatment, water-use efficiency, environmental flows requirement, international cooperation, capacity-building and stakeholder participation.

Target 6.4 of SDG 6 addresses water-use efficiency and water stress, pursuing the following: "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". The following two indicators were formulated under this target:

6.4.1 Change in water-use efficiency over time

6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources

For each indicator, monitoring methodologies and other support tools were developed and tested in five pilot countries – Jordan, the Netherlands, Peru, Senegal and Uganda. These were chosen based on the countries' expressions of interest and to ensure a good representation of global regions.

This report describes the methodology testing process for indicator 6.4.2 in the five pilot countries (section 2) and presents the global baseline (2015–2018) for this indicator (section 3).

Methodology testing

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 taking into account environmental flow requirements (EFR). It is calculated using the following formula:

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

The MDG framework already had a water stress indicator related to target 7.A, defined as "proportion of total water resources used". Although the MDGs were only defined in 1999, these parameters were being monitored by the Food and Agriculture Organization of the United Nations (FAO) through its global water information system, AQUASTAT, since 1994. The definition for SDG indicator 6.4.2 is relatively similar to that of the MDG indicator with the exception that it explicitly takes into consideration EFR.

As an extension of the MDG indicator, countries were already familiar with the SDG indicator methodology and data were mostly accessible and updated from country institutions. Information was also available from AQUASTAT, although not for EFR. The main difficulties when applying this methodology therefore arose when estimating this last variable. None of the countries had undertaken specific studies on EFR data except for Uganda, which had some figures from the Environmental Flow Manual prepared for the Nile Basin Initiative project. In the case of Jordan, the estimation was made based on the water pumped to preserve the Azraq oasis. Peru and Senegal used the International Water Management Institute's (IWMI) estimations at the national level from its *Global Assessment of Environmental Flows and Scarcity*. The Netherlands considered different international models for the estimation of environmental flows.

To implement and test the methodology, all pilot countries established working groups with relevant stakeholders to gather the required expert knowledge. A national institution was identified to lead the groups in the process of compiling the indicator data. It was tasked with coordinating the review of all national, subnational and basin unit sources of relevant data, such as maps, reports, yearbooks and articles. The data-collection exercise focused on the most recent data, without excluding any potential sources of information. Partial data (with respect to time or area), such as data produced by local projects, were also collected. Meetings with all the institutions involved took place throughout 2016 to track progress, share findings and validate the results obtained.

For each SDG indicator, a United Nations organization was designated to coordinate activities and act as custodian. In the case of indicator 6.4.2, FAO was designated to provide technical and/or logistical support to the countries that requested it.

Even though the data-collection process was feasible for all pilot countries, certain problems were encountered that should be taken into account for future reference:

- **Data inconsistency among various sources.** The availability of different information sources for the same variable was sometimes problematic since figures could vary depending on the source consulted (due to years of reference considered or other components taken into account). To address this challenge in future, the factors that caused the differences must be understood and the data harmonized, or the value with the reference that best matches the definition stated in the indicator's methodology must be selected. It is also important to maintain the same data source and estimation methodology over time.
- **Lack of EFR data.** None of the pilot countries had statistical data or had developed an in-country study to be able to draw their own figure for this variable. This seems to be the case for most countries in the world. However, free, online data sets are available at the international level, such as the IWMI *Global Assessment of Environmental Flows and Scarcity*. As such, countries can assess their own EFR based on the more detailed knowledge they have of their natural and social conditions.
- **Weak monitoring by country institutions.** While data were generally available, they were not always in the format, quality, quantity and frequency required. In other cases, certain parameters were being poorly monitored, or not at all.
- **Poor or non-existent coordination at the country level.** There is a need to strengthen countries' capacity and mobilize resources to implement the methodology, and to improve cooperation, coordination and sharing of responsibilities and information among the institutions involved in monitoring the indicator.
- **Reference years/periods.** Although data were generally up to date, reference years or periods sometimes varied between variables and countries. In this regard, it is essential to always specify the reference years used.
- **Outdated data.** If up-to-date data are not available (from in-country or international sources), significant efforts should be made to provide the most accurate estimate possible.
- **Weak reporting from country institutions into international databases.** It was noted that international databases such as AQUASTAT, which serve as repositories for data provided by countries, did not always have the latest figures available. Countries should therefore endeavour to share their most recent data with these international sources.
- **Double counting.** There was a potential risk of counting a value more than once when computing freshwater withdrawals by the different sectors.

The pilot exercise was an opportunity to further improve data collection and estimations in each of the countries and furthermore, to improve the way water resources are managed. The necessary involvement of different agencies in the process helped strengthen institutional relations, build and consolidate networks of professionals, which will help improve the monitoring of the indicator and, most likely, other aspects of water management in the country as well.

"Worldwide, 32 countries are experiencing water stress of between 25 and 70 per cent; 22 countries experience it above 70 per cent and are considered to be seriously stressed; in 15 countries, this figure rises to above 100 per cent, and of these, four have water stress above 1,000 per cent."

Global data

The world's average water stress stands at almost 13 per cent, although evidently, there are significant differences among world regions, a fact that a global assessment hides. For example, sub-Saharan Africa and South America have a low level of water stress (about 3 per cent), whereas in Northern Africa and Western Asia, water stress is very high (72 per cent). Similarly, regional averages mask realities at the country level. For instance, within the Northern Africa and Western Asia region, some countries in the Arabian Peninsula can reach water stress indicator values of over 1,000 per cent.

Worldwide, 32 countries are experiencing water stress of between 25 and 70 per cent; 22 countries experience it above 70 per cent and are considered to be seriously stressed; in 15 countries, this figure rises to above 100 per cent, and of these, four have water stress above 1,000 per cent. In the latter four, the demand for freshwater is largely being met through desalination.

The FAO database, AQUASTAT, was used as the international source to obtain figures for countries all over the world. It can provide figures for two of the three main variables in the methodology – TRWR and TFWW – for 180 countries. However, since AQUASTAT is a repository for data reported by countries, it does not produce new figures. This means that without individual country efforts, the data stored here are not updated, and consequently cannot be used for monitoring. To monitor the indicator over time, each country needs to establish a national data-collection mechanism or strengthen its existing mechanism.

As for EFR, figures at the country level were taken from the IWMI Water Data Portal. However, countries can assess their own EFR based on the more detailed knowledge they have of their natural and social conditions, taking into account factors such as the level of development, population density, availability of non-conventional water sources, specific ecosystem needs and climatic conditions.

Drought in Lake Hume, Australia. Photo: Tim J Keegan/Creative Commons

KEY MESSAGES AND RECOMMENDATIONS

To date, the Inter-agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDG) has not defined a framework for data collection on global indicators to provide guidance to Member States and custodian agencies alike – the only clear indication being that countries should retain ownership of their data and of the monitoring process in general. The IAEG-SDG is expected to agree on a standardized reporting framework during its next meeting, in autumn 2018. The establishment of such a framework will help significantly improve and rationalize the data-collection process for the SDG global indicators, clarifying the roles and responsibilities of both national institutions and custodian agencies.

For further implementation of the SDG indicator methodologies, specific national data should be collected to compute the indicator. To this end, countries must take ownership of the process and be mindful of the importance of quality, timely and reliable disaggregated data and their accessibility in informing decision-making. Custodian United Nations organizations must endeavour to raise awareness of this point, as well as of the interlinkages with other SDG 6 indicators, and must support countries during this process. Countries should have a good understanding of the methodology and be aware of the issues to take into account when using the indicator's formula. This is also a task for custodian United Nations organizations when explaining the methodology. In this regard, FAO has prepared an online course on indicator 6.4.2 (including quizzes) to make sure the methodology is well communicated and can be easily applied by the country teams.

To enable comparison, it is important that the data provided by countries be accompanied by the relevant metadata, to specify how the information has been obtained, which reference years and units of measurement have been used, etc. The AQUASTAT questionnaire offers guidance on how to prepare this metadata. Moreover, FAO provides countries with a calculation sheet in order to keep consistency when compiling the data.

The pilot phase has demonstrated that monitoring a given indicator at the country level calls for the involvement of various stakeholders and institutions. Countries should appoint a lead institution to coordinate these stakeholders – ideally, an institution involved in the water sector or statistics at the national level. The lead agency plays a critical role in the successful and timely monitoring of the indicator. It will ensure that all those involved have a clear understanding of their role in the process, the actions to be implemented and the support they can provide and receive within said role. Custodian United Nations organizations should endeavour to develop strong bonds with these lead institutions.

There is a strong complementarity between the two indicators of target 6.4. While indicator 6.4.1 is an economic indicator, assessing to what extent economic growth relies on the utilization of water resources, indicator 6.4.2 is an environmental indicator, showing the physical availability of freshwater resources. By using these two sets of information together, decision makers can gain an understanding of how growing water usage affects the availability of the water resources.

Data for indicator 6.4.2 should ideally be collected annually and reported every two years. However, a reporting period of up to three years is also acceptable.

1

Introduction and background

A mother gives her child a bowl of clean water in Charsardda District, in Pakistan. Photo: UN Photo/UNICEF/ZAK

In September 2015, Heads of State from all around the world adopted the 2030 Agenda for Sustainable Development, consisting of 17 Sustainable Development Goals (SDGs) with 169 targets. The 2030 Agenda includes a goal on water and sanitation (SDG 6) that sets out to "ensure availability and sustainable management of water and sanitation for all" (UNGA, 2015).

Access to safe water and sanitation and sound management of freshwater ecosystems are at the very core of sustainable development. Not only does SDG 6 have strong linkages with all the other SDGs, it is essential to achieving them. In other words, the successful implementation of the 2030 Agenda will strongly depend on meeting SDG 6 (CBS, 2016).

SDG 6 expands the focus of Millennium Development Goal 7 (MDG 7) on drinking water and sanitation to the entire water cycle, including the management of water, wastewater and ecosystem resources (UNGA, 2015). It also addresses other aspects of water management such as international cooperation, capacity-building and stakeholder participation. This is reflected by the higher number of targets set – while MDG 7 had two water-related targets, SDG 6 includes eight (Box 1).

Target 6.4 deals with water scarcity, aiming to ensure there is sufficient water for the population, the economy and the environment by increasing water-use efficiency across socioeconomic sectors. Two indicators were developed to track progress for this target:

> **6.4.1 Change in water-use efficiency over time**
>
> **6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources**

For target 6.4, the MDG framework already had a water stress indicator related to target 7.A, defined as "proportion of total water resources used". Although the MDGs were only defined in 1999, these parameters were being monitored by the Food and Agriculture Organization of the United Nations (FAO) through its global water information system, AQUASTAT, since 1994.

KEY FACTS

A high level of water stress can result in **negative effects on economic development and food security**, increasing competition and potential conflict among users.

Indicator 6.4.2 was formulated to ensure **continuity with the MDG process**, and for its **intrinsic importance in assessing a country's freshwater resources.**

BOX 1

Water-related targets for MDG 7 and SDG 6

MDG 7 (2000–2015)	**SDG 6 (2015–2030)**
7.A Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources. 7.C Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all. 6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations. 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally. **6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.** 6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate. 6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes. 6.a By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies. 6.b Support and strengthen the participation of local communities in improving water and sanitation management.

The definition for SDG indicator 6.4.2 is relatively similar to that of the MDG indicator with the exception that it takes into consideration environmental flow requirements (EFR) (see section 2.1.1). Indicator 6.4.2 was formulated to ensure continuity with the MDG process, and for its intrinsic importance in assessing a country's freshwater resources.

A high level of water stress can result in negative effects on economic development and food security, increasing competition and potential conflict among users. This calls for effective supply and demand management policies (linked to targets 6.3 and 6.5) and an increase in water-use efficiency. Securing EFR is also essential to maintaining ecosystem health and resilience (related to target 6.6 and SDG 15).

As acknowledged by the United Nations General Assembly (UNGA, 2015), quality, accessible, timely and reliable disaggregated data are needed to help measure SDG progress and to ensure that no one is left behind in the process. Access to reliable data is also essential for well-informed decision-making.

To that end, UN-Water launched Integrated Monitoring of Water and Sanitation Related SDG Targets, an inter-agency initiative known as GEMI. GEMI establishes and manages a coherent monitoring framework for the implementation of SDG targets 6.3 to 6.6.[1] It was established in 2014 as a partnership between the Food and Agriculture Organization of the United Nations (FAO), UN Environment, the United Nations Human Settlements Programme (UN-Habitat), the United Nations Economic Commission for Europe (UNECE), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Children's Fund (UNICEF), the World Health Organization (WHO) and the World Meteorological Organization (WMO).

The first phase of GEMI implementation (2015–2018) has focused on developing monitoring methodologies and other support tools for the indicators related to the above-mentioned targets. This included a country consultation exercise (proof of concept) in 2016 in five pilot countries: Jordan, the Netherlands, Peru, Senegal and Uganda. These were chosen based on countries' expressions of interest and to ensure a good representation of global regions (sub-Saharan Africa, Europe, Latin America and the Caribbean and Northern Africa/the Middle East). Asia was originally represented by Bangladesh, but there were significant delays in the process due to the country's complex institutional environment.

In addition, GEMI has also worked on establishing a global baseline for SDG targets 6.3 to 6.6.

This report describes the methodology testing process for indicator 6.4.2 in the five pilot countries (section 2) and presents the global baseline (2015–2018) for this indicator (section 3).

[1] Targets 6.1 and 6.2 are covered by the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) developed by WHO and UNICEF.

2

Method and process

Children helping an old woman fill her containers with water from a community pump in Dobra Khira near Sanaa. Photo: UN Photo/Ian Steele

2.1. Methodology

2.1.1 About the methodology developed by GEMI

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 taking into account EFR. It is calculated using the following formula:

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

Where:

TFWW = Total freshwater withdrawal (km3/year). This is usually calculated as the sum of withdrawal from renewable freshwater resources and from fossil groundwater for agriculture, industries and services minus the direct use of non-conventional water as (treated) wastewater, the direct use of agricultural drainage water and the use of desalinated water. Freshwater withdrawal for each sector is defined below:

Agricultural freshwater withdrawal is the annual quantity of water withdrawn for irrigation, livestock (watering, sanitation, cleaning, etc.)[2] and aquaculture purposes. It includes water from over-abstraction of renewable groundwater or withdrawal of fossil groundwater. This category refers to self-supplied agricultural activities not connected to the public distribution network. If the water is provided by a public water supply network, it should be included under the services water withdrawal category. This category corresponds to the International Standard Industrial Classification (ISIC) Rev. 4 section A (Annex 3).

KEY FACTS

Data for indicator 6.4.2 should ideally be reported at the country level **every two years**.

The implementation of the pilot phase has demonstrated the importance of **stakeholder engagement** in the process. It is crucial that countries take **ownership and involve all the relevant institutions and agencies.**

[2] The subcategory of freshwater withdrawal for livestock does not include water withdrawal for irrigated fodder, meadows and pastures, which are included under water withdrawal for irrigation. It also does not include water withdrawal for the preparation of products derived from animals, which is included under industrial water withdrawal. If connected to the public water supply network, water withdrawal for livestock is included under services water withdrawal.

Industrial freshwater withdrawal is the annual quantity of water withdrawn for industrial uses. It includes water from over-abstraction of renewable groundwater or withdrawal of fossil groundwater. This category refers to self-supplied industries not connected to the public distribution network. If the water is provided by a public water supply network, it should be included under the services water withdrawal category. This category also includes water used for cooling in thermo-electric plants; it does not include hydropower, however, it is recommended that losses through evaporation from artificial lakes used for hydropower production be included here. This category corresponds to the ISIC Rev. 4 sections B, C, D and F (Annex 3).

Services freshwater withdrawal is the annual quantity of water withdrawn primarily for direct use by the population. It includes water from over-abstraction of renewable groundwater or withdrawal of fossil groundwater. It is usually computed as the total water withdrawn by the public distribution network. It can include the part of the industry and agricultural sector connected to the municipal distribution network. This category corresponds to the ISIC Rev. 4 section E (Annex 3).

Table 1 summarizes what should (and should not) be included when calculating TFWW.

TRWR = Total renewable freshwater resources (km^3/year). This is the sum of internal renewable freshwater resources (those generated from endogenous precipitation) and external renewable freshwater resources (flows entering the country, taking into consideration the quantity of flows reserved to upstream and downstream countries through agreements or treaties).

EFR = Environmental flow requirements (km^3/year). This refers to the quantity and timing of freshwater flows required to sustain freshwater ecosystems and the human livelihoods and well-being that depend on them. As evident in the description of the pilot countries' processes, methods to compute EFR are extremely varied and range from global estimates to comprehensive assessments for river reaches.

Data for indicator 6.4.2 should ideally be reported at the country level every two years. However, a reporting period of up to three years is also acceptable.

If data are available at the subnational level, these should also be provided, especially for larger countries or countries with marked climatic differences within their territory. The most suitable units to be used for this exercise are river basins, aggregated according to the circumstances of each country.

Table 1. Categories to include in total freshwater withdrawal (TFWW)

✓ **surface freshwater** ✓ **renewable groundwater** ✓ **fossil groundwater**

✓ **direct use of non-conventional water (<u>direct</u> use of treated wastewater, <u>direct</u> use of agricultural drainage water, desalinated water)**

AGRICULTURAL FRESHWATER WITHDRAWAL – ISIC SECTION A			
Freshwater withdrawal for **irrigation**	Irrigation purposes	✓	Agricultural water withdrawal
	Irrigated fodder	✓	
	Irrigated meadows and pastures	✓	
Freshwater withdrawal for **livestock**	Livestock watering	✓	
	Sanitation	✓	
	Cleaning of stables, etc.	✓	
	Irrigated fodder	✗	
	Irrigated meadows and pastures	✗	
Freshwater withdrawal for **aquaculture**	Aquaculture purposes	✓	
	However, if the water is provided by/connected to the public water supply network, it should be included under the category of services water withdrawal, regardless of its use.	✗	Services water withdrawal (agricultural water withdrawal if data available)
	Transformation of agricultural products	✗	Industrial water withdrawal

INDUSTRIAL FRESHWATER WITHDRAWAL – ISIC SECTIONS B, C, D AND F			
	Self-supplied industries not connected to the public distribution network	✓	Industrial water withdrawal
	Cooling of thermo-electric, hydroelectric and nuclear power plants	✓	Industrial water withdrawal
	Hydropower	✗	Not included
	Losses through evaporation from artificial lakes used for hydropower production	✓	Industrial water withdrawal
	However, if the water is provided by/connected to the public water supply network, it should be included under the category of services water withdrawal, regardless of its use.	✗	Services water withdrawal (industrial water withdrawal if data available)
SERVICES[3] FRESHWATER WITHDRAWAL – ISIC SECTIONS E, G–T			
	Total water withdrawn by the public distribution network	✓	Services water withdrawal
	Agriculture and industries connected to the municipal distribution network	✓	Services water withdrawal

3 In AQUASTAT, services water withdrawal is reported as municipal water withdrawal.

BOX 2

Methodology development for indicator 6.4.2

The development of the methodology for this indicator evolved from the existing MDG indicator 7.5: proportion of total water resources used. This indicator was defined as "the total volume of groundwater and surface water withdrawn from their sources for human use (in the agricultural, domestic/municipal and industrial sectors), expressed as a percentage of the total actual renewable water resources".

During the development of SDG indicator 6.4.2, the possibility of using water consumption instead of water withdrawal was considered. However, water withdrawal was ultimately kept as the parameter to use to maintain consistency with the MDG indicator, and to reduce uncertainty due to the scarcity of data on return flows and on consumption in general.

The formulation of the MDG indicator implied the need to reserve a proportion of water resources for covering EFR, as stated in the relevant metadata. In discussing the formulation of indicator 6.4.2, it became apparent that keeping EFR implicit could create a potentially false sense of security in situations where water scarcity is not apparent. At the same time, the importance of reserving water for the functioning of ecosystems was not highlighted by the previous formulation.

Introducing EFR into the formula implied the need to collect data that are not usually monitored by the hydrological services in many countries, nor are they available in international databases such as AQUASTAT. However, EFR was included in the formula given its paramount importance to the indicator in terms of policy, and considering that while some countries do not have the relevant data, at the global level, the International Water Management Institute (IWMI) has compiled a country-based data set that can be used as a default.

As a next step, FAO is working with IWMI, the United Nations University (UNU) and UN Environment to define a user-friendly approach to estimate EFR, both for computing indicator 6.4.2 and for identifying and assessing disaggregated data for water stress at the sub-country level.

2.1.2. Applying and testing the methodology in the five pilot countries

As previously mentioned, the MDG monitoring framework already included an indicator on water stress, defined as "proportion of total water resources used". The main difference between this and the SDG indicator 6.4.2 is that the latter also takes into consideration EFR. Thus, during the pilot phase, countries were already familiar with the SDG indicator methodology and most of the data were accessible and updated from country institutions. Information was also available from international sources, such as AQUASTAT.

In some cases, the existence of various information sources was problematic since different figures could be found for the same variable. For instance, data for agricultural withdrawals in Uganda were available from the Government, AQUASTAT and the Nile Basin Initiative, and there were considerable differences among the numbers provided by each source. In these cases, it is important to understand which factors caused the differences, and to either harmonize them or choose the value whose metadata best matches the definition stated in the indicator's methodology.

As might be expected, the main difficulties when applying this methodology arose when estimating EFR. None of the pilot countries had studied this variable at the national level, except for Uganda, which had some figures from the Environmental Flow Manual prepared for the Nile Basin Initiative project. Peru is about to undertake studies of this kind and has a Chief Resolution (#98 2016-ANA) to regulate their implementation.

Except for EFR and a few other cases, statistical data were readily available from government sources for the variables included in the methodology. Possible data gaps were filled with estimations or data taken from international sources such as AQUASTAT. These figures were updated or estimated up to 2016, 2015 or 2014 and were generally reported annually or biennially. For most countries, data are consolidated and published at the country level, except for Peru, which also disaggregates data for its three major basins (Pacific, Amazon and Titicaca). More information on this is provided in section 2.2.2.

To implement and test the methodology, all pilot countries established working groups with relevant stakeholders to share findings and validate the data and analysis conducted (see section 2.2.1 and 2.3).

2.1.3. The monitoring ladder

The monitoring ladder for indicator 6.4.2 is defined as follows:

1. At the first level, the indicator can be populated with estimations based on national data aggregated to the country level. If needed, data can be retrieved from international databases on water availability and withdrawals by different sectors. Estimates for EFR based on literature values.

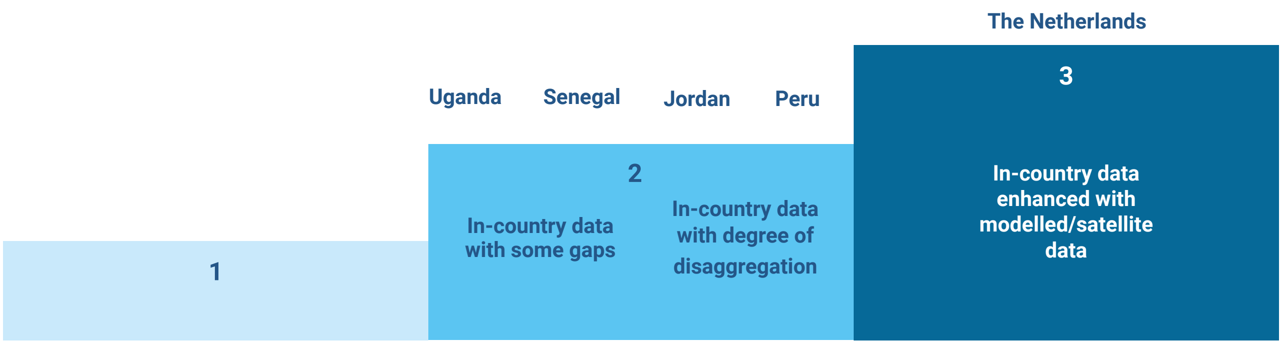
2. At the next level, the indicator can be populated with nationally produced data, which can increasingly be disaggregated to the subnational basin unit level. Estimates for EFR based on literature values.

3. For more advanced levels, the nationally produced data have a high spatial and temporal resolution (e.g. geo-referenced and based on metered volumes) and can be fully disaggregated by source (surface water/groundwater) and use (economic activity). EFR are assessed and refined according to national estimates, based on a country's more detailed knowledge of its natural and social conditions, taking into account factors such as the level of development, population density, availability of non-conventional water sources, specific ecosystem needs and climatic conditions.

The pilot countries had statistical data available at the country level for most of the variables defined for indicator 6.4.2. As such, they were all already beyond level 2 of the ladder (Figure 1). The Netherlands could even be considered level 3 as it is able to provide more accurate data, fully disaggregated by source and use. The country can also supplement statistical data with remote sensing and model data for a better spatial and temporal resolution, to estimate the following:

- Precipitation data from measuring stations over the country's surface using radar measurements
- Evapotranspiration (ET): instead of using potential ET, actual ET is estimated using remote sensing

Figure 1. Country situation in the ladder approach



Peru would also be considered close to level 3 since it can present data at the basin level for TRWR and TFWW. Jordan and Senegal would follow as they produce in-country statistical data, but only at the national level. Uganda would be considered closer to level 1 because the figures on industrial freshwater withdrawals had to be obtained from AQUASTAT, there was no official government figure on water for livestock (despite its importance in the country) and data on TRWR was not updated (the period available for analysis was 1952 to 1978).

BOX 3

What next for the IAEG-SDG?

The Inter-agency and Expert Group on SDG Indicators (IAEG-SDG) was established by the United Nations Statistical Commission to develop and implement the SDG global indicator framework and targets of the 2030 Agenda. It comprises United Nations Member States, with regional and international agencies participating as observers.

The global indicator framework was agreed upon in March 2017. Following on from this, the IAEG-SDG's work will now entail finalizing a framework for indicator monitoring and reporting, and reviewing and refining the indicator framework and its implementation on an ongoing basis. The group is expected to agree on a standardized reporting framework during its next meeting, in autumn 2018. The establishment of such a framework will help improve and rationalize the data-collection process for the SDG global indicators, clarifying the roles and responsibilities of national institutions and custodian agencies alike.

2.2. Stakeholders and sources of data

2.2.1. Stakeholders involved

All the pilot countries engaged relevant institutions in the SDG 6 process to provide data, implement and test the methodology and endorse the results obtained. **Table 2** provides a comparative summary of the institutions/organizations involved in each of the countries.

The main institutions involved were water-related ministries and agencies and the departments of statistics. In the case of the Netherlands, research institutions (Deltares) and consultancies (eLEAF) were also involved in providing and analysing the data.

A child washes himself in Kallyanpur, a slum in Bangladesh's capital, Dhaka. Photo: UN Photo/Kibae Park

Table 2. Stakeholders involved in country testing of the indicator 6.4.2 methodology

	General coordination	Main data-collecting agencies	Other government bodies/institutions involved
The Netherlands	Ministry of Infrastructure and Water Management – Delta Programme	Statistics Netherlands (CBS)	Deltares, eLEAF, Vitens-Evides International, Association of Dutch Water Companies (Vewin), water boards, Netherlands Environmental Assessment Agency, Water Footprint Network, IHE Delft Institute for Water Education, Netherlands Water Partnership
Peru	National Water Authority (ANA)	National Water Authority (ANA) Ministry of Agriculture and Irrigation National Institute for Statistics and Informatics (INEI)	Water Resources Management Unit (ANA), Water Resources Planning and Conservation Unit (ANA), FAO
Jordan	Ministry of Water and Irrigation	Ministry of Water and Irrigation Department of Statistics (DOS) Ministry of Agriculture Ministry of Planning and International Cooperation	Environment Statistics Division (DOS), FAO
Uganda	Ministry of Water and Environment (MWE) (Water for Production Department and Water Resource Planning & Regulation Department)	Ministry of Water and Environment National Water and Sewerage Corporation Ministry of Gender, Labour and Social Development Uganda Bureau of Statistics Uganda Prisons FAO and United Nations Forum on Forests (UNFF) Buganda Kingdom	Ministry of Agriculture, Animal Industry and Fisheries Ministry of Trade, Industry and Cooperatives (Department of Industry and Technology) Ministry of Finance, Planning and Economic Development
Senegal	Ministry of Water and Sanitation (Water Resources Management and Planning Unit)	Ministry of Water and Sanitation Water Utilities Association Statistics and Demography Agency (ANSD)	

Source: National reports ANA, 2016; Abu Zahra, 2016; DGPRE, 2016; MWE, 2016; CBS, 2016.

2.2.3. Sources of data by variable type

This section provides an overview of the various sources consulted in each of the pilot countries for the main components of the methodology: **(a) TFWW (Table 3); (b) TRWR (Table 3); and (c) EFR (Table 4).**

The process of data gathering proved that, except for EFR and a few other cases, statistical data were mostly available from government sources for the variables included in the methodology. Whenever data were missing, e.g. the groundwater inflow from neighbouring countries in the Netherlands or the withdrawals for industrial use in Uganda, they were either estimated or taken from international sources such as AQUASTAT or IWMI.

Data were generally updated or estimated up to 2016, 2015 or 2014. In the case of the Netherlands, Jordan and Peru, figures are reported annually or biennially, as recommended in the GEMI methodology. For Senegal and Uganda, the frequency of data collection and publication was not specified.

Countries consolidated and published data at the country level, except for Peru, which also disaggregated data by its three major basins (Pacific, Amazon and Titicaca) to give a less biased picture of the country's situation. This is highly relevant for an indicator on water stress, considering that the Pacific Basin accounts for only 3 per cent of the country's total freshwater resources, but 57 per cent of its withdrawals.

Even though data were available from most sources, certain challenges were encountered that should be considered by country teams when collecting the data. These are described in section 2.3.3.

A focus on environmental flow requirements

This component has proven the most difficult to obtain data on. Indeed, none of the pilot countries had statistical data or had developed a specific in-country study to be able to draw their own figure (Table 4).

Jordan estimated its EFR using its most important natural reserve as the reference: the Azraq oasis (a Ramsar site since 1977). The Water Authority of Jordan (WAJ) pumps about 1.5 10^6 m^3 of water per year from artesian wells to the wetland reserve to preserve what remains of the oasis. Based on this figure, EFR were estimated at about 2 10^6 m^3 for the last four years, also taking into consideration the other natural areas in the country: the Dead Sea, Wadi Mujib and Wadi Wala. However, it is important to note that the water pumped into the Azraq oasis is only sufficient to restore part of the oasis. Historical flow of the springs in Azraq is about 10 10^6 m^3, which is considered the natural requirement for the basin.

The Netherlands used three different approaches for estimating its EFR:

- Method Q90: the flow that exceeds 90 per cent of the record period is accounted for as the flow needed to maintain the ecosystems.
- Method 20–40: this estimates that between 20 and 40 per cent of the total renewable freshwater resources is needed for the ecosystems. For the Netherlands, this was considered to be 30 per cent.
- Method model input data: EFR is estimated by the Netherlands Hydrological Instrument (NHI) model using input data related to vulnerable aquatic ecosystems.

Peru and Senegal used the country estimates provided in IWMI's Water Data Portal, which are 37.9 and 20 per cent of mean annual flow, respectively. Peru also provided estimates at the basin level using IWMI data from neighbouring countries that better correspond to the conditions of each of the main country basins: for the Pacific Basin, data from Chile were used; for the Amazon Basin, data from Brazil; and for the Titicaca Basin, data from Bolivia (Plurinational State of).

In the case of **Uganda**, EFR as a percentage of the mean annual river flow was derived based on the Nile Basin Initiative Environmental Flow Manual. This manual provides an estimation for the Mara and Malaba river basins, which are representative of other basins in the country. The average value for the two catchments was 31.43 per cent.

BOX 4

Peru, a case for subnational disaggregation

The case of Peru is very interesting. According to estimates presented in this report, the level of water stress in Peru is very low, around 1 per cent. However, the situation from the perspective of a decision maker is very different: most population and economic activity (including irrigation and mineral development) is located in the extremely arid coastal area of the Pacific Ocean, which has very low run-off, while most run-off occurs in the Amazon Basin, which is separated from the coastal area by the Andes mountain range. As such, the country needs water (i.e. water stress is high) on one side of the mountains and has a lot of water and very little use for it on the other side. This makes the average estimate for the entire country quite irrelevant in terms of policy support information.

Table 3. Sources of data for total freshwater withdrawal and total renewable freshwater resources

	Jordan	The Netherlands	Peru	Senegal	Uganda
			Total freshwater withdrawal		
Agriculture freshwater withdrawal (AW)	Ministry of Water and Irrigation (*Water Balance Reports*)	Statistics Netherlands (CBS) LEI research institute (for area under irrigation)	Water Resources Management Unit (from local operators)	Organizations in charge of water supply Statistics and Demography Agency (ANSD)	Ministry of Water and Environment (MWE) *Water for livestock estimated based on livestock population
Industry freshwater withdrawal (IW)	Department of Statistics (*Environment Statistics Reports*)	Statistics Netherlands (CBS) (annual environmental reports, national groundwater register)	Water Resources Management Unit (from local operators)	Organizations in charge of water supply Statistics and Demography Agency (ANSD)	AQUASTAT (figure for 2008)
Services freshwater withdrawal (SW)	Ministry of Water and Irrigation and Department of Statistics Data gaps were estimated using intermediate consumption	Association of Dutch Water Companies (Vewin)	Water Resources Management Unit (from local operators)	Organizations in charge of water supply Statistics and Demography Agency (ANSD)	Urban supply: National Water and Sewerage Corporation MWE (database for Small Towns Water Supply) Rural supply: Estimated based on rural population
Frequency of collection/ publication	Collected annually, published every four years	Collected biennially (by economic activity), annually (total withdrawls)	Collected annually	Not specified	AW: less than every 5 years IW: Every 5 years (AQUASTAT) SW: annually
Coverage	Country level	Country level Subnational level Basin level	Country level Basin level	Country level	Country level

	Jordan	The Netherlands	Peru	Senegal	Uganda
Total renewable freshwater resources					
Internal renewable freshwater resources	Ministry of Water and Irrigation *(Water Balance Reports)*	Statistics Netherlands Royal Netherlands Meteorological Institute	National Water Authority (from the National Water Resources Plan, 2015)	Not specified	Ministry of Water and Environment (from National Water Resources Assessment Report, 2013)
External renewable freshwater resources		Estimated by Deltares using the NHI		Not specified	Not specified
Frequency of collection/ publication	Collected annually	Collected annually	Not specified	Not specified	Not specified
Coverage	Country level, Jordan Valley and highland areas	Country level	Country level Basin level	Country level	Country level

Source: National reports ANA, 2016; Abu Zahra, 2016; DGPRE, 2016; MWE, 2016; CBS, 2016.

Table 4. Estimation of environmental flow requirements in pilot countries

Jordan	The Netherlands	Peru	Senegal	Uganda
2 10^6 m^3 Azraq oasis reserve used as reference	a) Flow that exceeds 90 per cent of the record period b) 30 per cent of the country's total renewable resources c) Input data from NHI	Countrywide: 37.9 per cent of the country's total renewable resources Basin-wide: • Pacific (Chile): 30.3 per cent • Amazon (Brazil): 34.6 per cent • Titicaca (Bolivia): 30.9 per cent	20 per cent of the country's total renewable resources	31.43 per cent of mean annual river flow
Source: National estimation based on water pumped to preserve Azraq oasis	*Source: Statistics Netherlands (2016)*	*Source: IWMI, Water Data Portal*	*Source: IWMI, Water Data Portal*	*Source: Nile Basin Initiative*

Source: National reports ANA, 2016; Abu Zahra, 2016; DGPRE, 2016; MWE, 2016; CBS, 2016.

2.3. Data-collection process

2.3.1. Approach

To implement and test the methodology, all pilot countries established working groups with relevant stakeholders (section 2.2.1.) to gather the required expert knowledge. A national institution was appointed in each country to lead the groups in the process of collecting and compiling the indicator data (Table 2). It was tasked with coordinating the review of all national, subnational and basin unit sources of relevant data, such as maps, reports, yearbooks and articles. The data-collection exercise focused on the most recent data, without excluding any potential sources of information. Partial data (with respect to time or area), such as data produced by local projects, were also collected.

In-country meetings with all the institutions involved were held throughout 2016 to track progress, share findings and endorse the results obtained. In addition, the Netherlands hosted a Work in Progress workshop in September 2016 that primarily gathered key representatives of all pilot countries and experts from GEMI-Target Teams from United Nations organizations. The aim of the meeting was to: (1) discuss the proof of concept process for GEMI SDG 6 indicators (6.3.1, 6.3.2, 6.4.1, 6.4.2, 6.5.1, 6.5.2 and 6.6.1); (2) share feedback, lessons learned and experiences on the proposed methods and indicators; and (3) identify additional activities and strategies to overcome the challenges encountered.

To provide country-specific support during the proof of concept process, a United Nations organization was designated to coordinate activities in each of the pilot countries and for each indicator (Table 5). In the case of indicator 6.4.2, it was FAO that provided technical and/or logistical support to the countries that requested it. In Jordan, Uganda and Peru, FAO also provided local consultants to support the working groups.

All countries engaged actively in the process and provided the data needed to establish the baseline for indicator 6.4.2.

Table 5. United Nations support to pilot countries

Country	Coordinating agency/agencies	
	GEMI process	Indicator 6.4.2
Jordan	UNESCO, UN-Habitat	FAO
The Netherlands	UNESCO	FAO
Peru	FAO, WHO	FAO
Senegal	FAO	FAO
Uganda	UN Environment	FAO

The implementation of the pilot phase has demonstrated the importance of stakeholder engagement in the process. It is crucial that countries take ownership and involve all the relevant institutions and agencies. Organizing in-person meetings helped build and strengthen relationships between members of working groups, and ensured they had a good understanding of the methodology requirements as well as of the importance of knowledge-sharing during the process. Effectively coordinating the institutions and organizations involved is also essential. It is important that country teams have a clear understanding of their role in the process, the actions to be implemented and the support they can provide and receive within said role.

2.3.2. Use of international data sources

International sources were used to fill gaps in the data at the national level. The data from these sources were discussed with countries in workshops and meetings to ensure their relevance. During the pilot phase, international sources informed the data-collection and compilation process in the following cases:

- IWMI and other models were used to estimate EFR for Jordan, Peru, Senegal and the Netherlands, as explained in section 2.2.2.
- IWMI data from neighbouring countries were used to estimate EFR at the basin level in Peru: for the Pacific Basin, data from Chile; for the Amazon Basin, data from Brazil; and for the Titicaca Basin, data from Bolivia (Plurinational State of).
- In Uganda, water for livestock and services withdrawal in rural areas had to be estimated. In the case of industrial water withdrawal, the AQUASTAT database was used as a data source.

2.3.3. Challenges and opportunities

The proof of concept process in the five pilot countries highlighted the following **challenges**, which should be taken into account in terms of future methodology implementation and regular monitoring of the indicator:

- **Lack of EFR data**

  None of the pilot countries had statistical data or had studied EFR at the national level to draw their own figure for this variable. This seems to be the case for most countries in the world. However, free, online data sets are available at international level, such as the IWMI *Global Assessment of Environmental Flows and Scarcity*. As such, countries can assess their own EFR based on the more detailed knowledge they have of their natural and social conditions.

- **Data inconsistency among various sources**

  The availability of different information sources for the same variable was sometimes problematic since figures could vary depending on the source consulted. This was an issue in Uganda, when estimating agricultural freshwater withdrawal, and in Senegal, when estimating TRWR. In these cases, the differences stemmed either from the years of reference considered (long-term averages versus yearly data) or from the factors taken into account for the calculations. For instance, in some cases, water for livestock, aquaculture or silviculture was not included in agricultural withdrawal. This is particularly relevant in countries where the agricultural non-crop production sector is important.

  To address this challenge in future, the factors that caused the differences must be understood and the data harmonized, or the value with the reference that best matches the definition stated in the indicator's methodology must be selected.

- **Weak coordination and monitoring by country institutions**

  While data were generally available, they were not always in the format, quality, quantity and frequency required. For instance, data on industrial withdrawal or renewable freshwater resources in Uganda were not sufficiently up to date. In other cases, certain parameters were not being monitored, such as freshwater withdrawal in Uganda's rural areas, or were poorly monitored, such as agricultural freshwater withdrawal in Senegal.

  It was also noted that in some cases, the institutional capacity and resources available were not adequate to implement the methodology. And that cooperation, coordination and sharing of responsibilities and information among the institutions involved in monitoring the indicator needed to be strengthened.

- **Reference years/periods**

  Although data were generally up to date, reference years or periods varied between variables and countries. A clear example of this was the periods considered to estimate TRWR. Depending on countries' capacities, official rainfall records start from different years and are updated with varying degrees of frequency. In this regard, it is essential for countries to always specify the reference years used and to endeavour to improve their monitoring capacity.

- **Parameters to take into account when defining a variable**

  To determine a figure for each of the variables considered for indicator 6.4.2, a number of components have to be taken into account, as specified in the methodology. During the pilot process, certain difficulties with some of these components were noted. These are explained below.

  When calculating freshwater withdrawal for energy, it is important to emphasize that this methodology does not include water used for hydropower, even though the System of Environmental-Economic Accounting (SEEA) does include this in the energy withdrawal category. This point was discussed at the beginning of the pilot process, yet it seems that some countries included it and others did not. For the purpose of SDG reporting, it was agreed to exclude hydropower water from the calculation as this is only removed from the environment for a very short time, and thus, including it would needlessly inflate the figures.

When determining TRWR, dam capacity and water resources stored in aquifers should not be included since TRWR refers to resources acquired by endogenous precipitation, plus the balances of water entering and leaving the country.

When determining internal renewable freshwater resources, it should be made clear to country teams that actual evapotranspiration must be deducted from internal precipitation.

- **Outdated data**

  If up-to-date data are not available (from in-country or international sources), significant efforts should be made to provide the most accurate estimate possible. This was an issue for industrial freshwater withdrawal in Uganda. The most recent data were from 2008 and these were used to provide the 2016 figure. Furthermore, figures deriving from Uganda's rainfall records, which were only available for the 1952–1978 period, were used to estimate the country's TRWR. A correction factor should have been introduced to consider the impacts of climate change.

- **Weak reporting from country institutions into international databases**

  When reporting the figures, it is very important for countries to reference all the sources used, the years considered for data collection/estimation and the type of data collected (statistical, modelled, remote sensing). This is essential to ensuring the quality of the process. However, it was noted that not all the pilot countries provided this information for all the variables considered.

  Furthermore, international databases such as AQUASTAT, which serve as repositories for data provided by countries, did not always have the latest figures available. Countries should therefore endeavour to share their most recent data with these international sources.

- **Double counting**

  There was a potential risk of counting a value more than once when computing freshwater withdrawals by the different sectors.

The pilot exercise was an opportunity to further improve data collection and estimations in each of the countries and furthermore, to improve the way water resources are managed. For instance, in Senegal, the testing of the methodology has led to the proposal of an action plan for the water and sanitation sector.

The necessary involvement of different agencies in the process has helped strengthen institutional relations, build and consolidate networks of professionals, which will help improve the monitoring of the indicator and, most likely, other aspects of water management in the country as well.

3

Results and analysis

A Sudanese student drinks and washes her face at a new water fountain built at the Omer El-Mukthar primary school for girls. Photo: Fred Noy

3.1. Global and regional estimates for indicator 6.4.2

After testing the methodology in the pilot countries, an initial baseline analysis for indicator 6.4.2 was conducted using available databases from international organizations (see section 3.2).

As explained in the introduction, indicator 6.4.2 derives from the previous MDG indicator 7.5 with the exception that the latter only accounted for water use for human activities, while the former includes EFR as an important use of water. Thus, water stress is defined as the percentage of TFWW by all major sectors, including EFR, from TRWR.

Water stress currently affects more than 2 billion people around the world, with this figure projected to increase. It affects countries on every continent and hinders the sustainability of natural resources, as well as economic and social development.

The world's average water stress stands at almost 13 per cent, although evidently, there are significant differences among countries and world regions,[4] a fact that a global or regional assessments hide (Figure 2 and Figure 3). Sub-Saharan Africa, as a whole, has a low level of water stress (3 per cent), a figure that masks the higher water stress in the southern part. For instance, South Africa has an average water stress of 43 per cent. Similarly, water stress values at the national level can conceal differences between wet and dry areas within a country, as illustrated by the case of Peru, which has a national average water stress of around 3 per cent, whereas water stress in the Pacific Basin is 52 per cent.

Oceania and Latin America and the Caribbean are the other two SDG regions with the lowest levels of regional water stress (2 and 3 per cent, respectively). Regions with the highest water stress are Northern Africa and Western Asia, followed by Central and Southern Asia. When looking more closely at these two broad regions (Figure 2), it is evident that water stress in Northern Africa is already above 100 per cent and that in Central Asia, it is almost 80 per cent. In the case of Eastern and South-Eastern Asia, the broad regional average indicates low water stress (19 per cent). However, the Eastern Asia region alone is already a little above 30 per cent.

KEY FACTS

Water stress currently affects more than **2 billion people around the world**, with this figure projected to increase. It affects countries on every continent and hinders the sustainability of natural resources, as well as economic and social development.

An analysis of trends in water stress for the past 20 years (1996–2016) shows that it has **increased for most countries in the world. In 26 countries, 15 of which are in Africa, water stress has more than doubled.**

Reducing water stress can be achieved by, for example, **improving water-use efficiency and shifting economic activities to less water-consuming sectors.**

[4] Annex 2 presents the countries included in each of the world's regions defined for this exercise.

Figure 2. Levels of water stress by region (%) (2015)

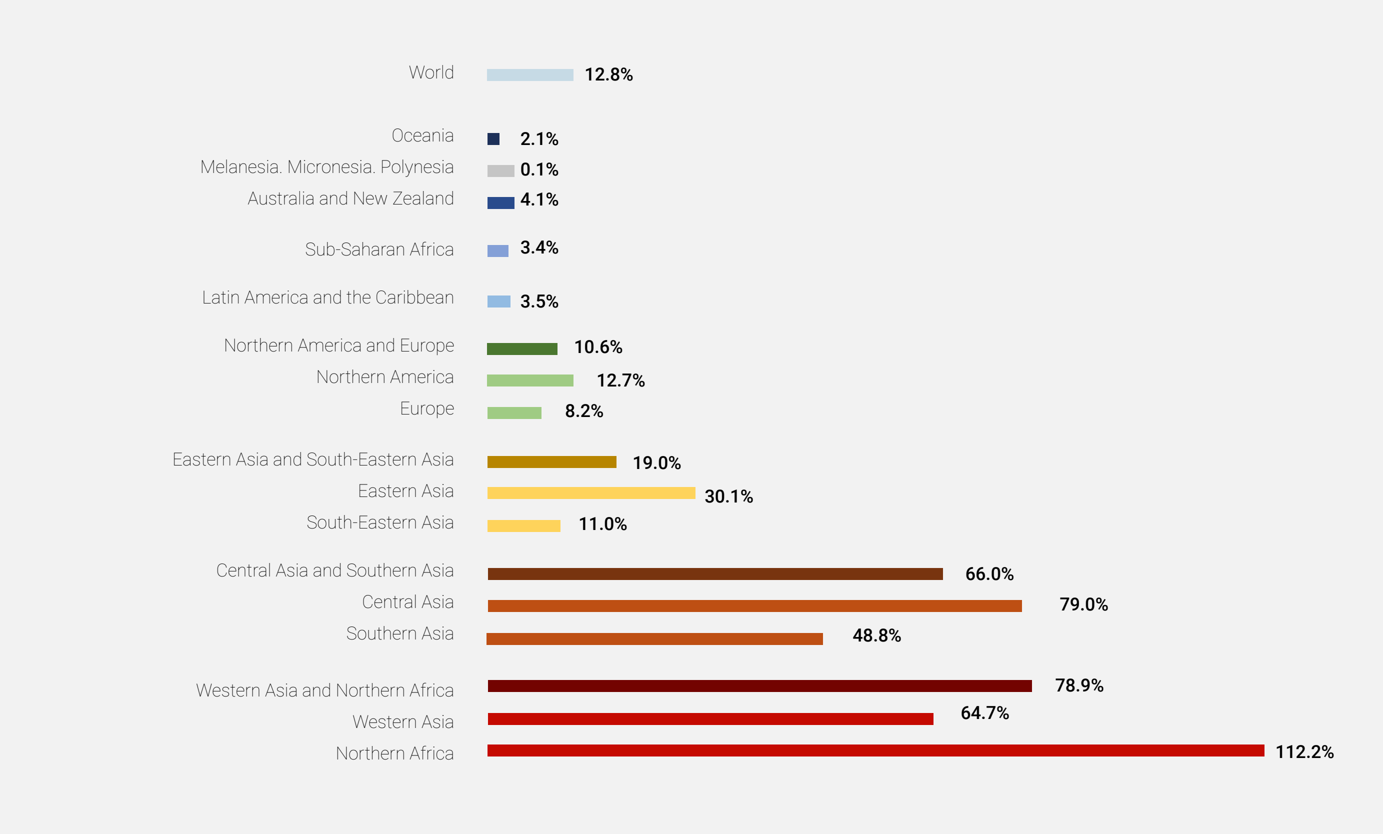
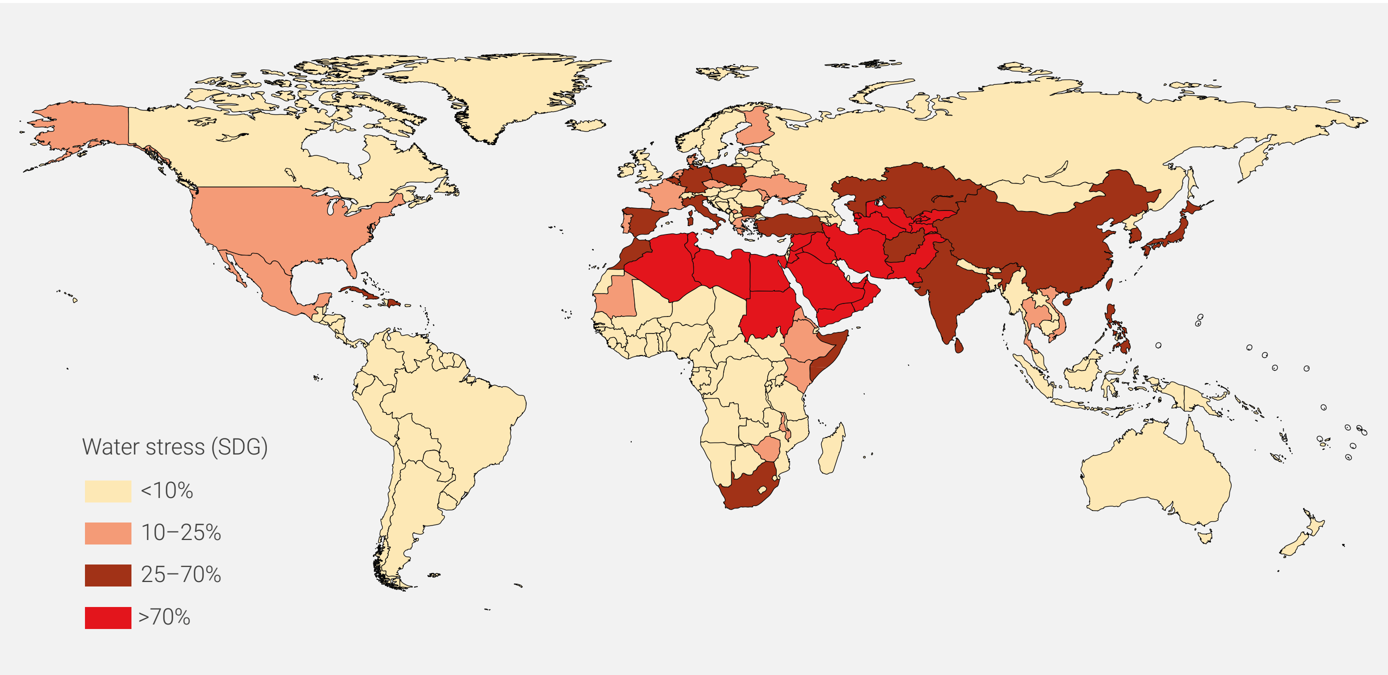


Figure 3. Levels of water stress by country (%) (2000–2015)



Data source: FAO Aquastat and IWMI

A more detailed analysis shows that 32 countries are experiencing water stress of between 25 and 70 per cent; 22 countries are above 70 per cent and are considered to be seriously stressed; in 15 countries, this figure rises to above 100 per cent, and of these, four have water stress above 1,000 per cent. The four countries are Kuwait, Libya, Saudi Arabia and the United Arab Emirates, where the demand for water is largely being met by desalination (Figure 3 and Table 6).

The distribution of water stress resembles a logarithmic curve, where most countries are below 50 per cent, with only a few surpassing this value but reaching above 1,000 per cent (Figure 4).

An analysis of trends in water stress for the past 20 years (1996–2016) shows that it has increased for most countries in the world. In 26 countries, 15 of which are in Africa, water stress has more than doubled. The likely reasons for these increases are increased economic activities, growing populations and improved ways to measure water usage, along with effects of climatic changes.

On the other hand, water scarcity has decreased for 44 countries, half of which are in Europe. Reducing water stress can be achieved by, for example, improving water-use efficiency and shifting economic activities to less water-consuming sectors.

Figure 4. Distribution of water sress by country (%) (AQUASTAT)

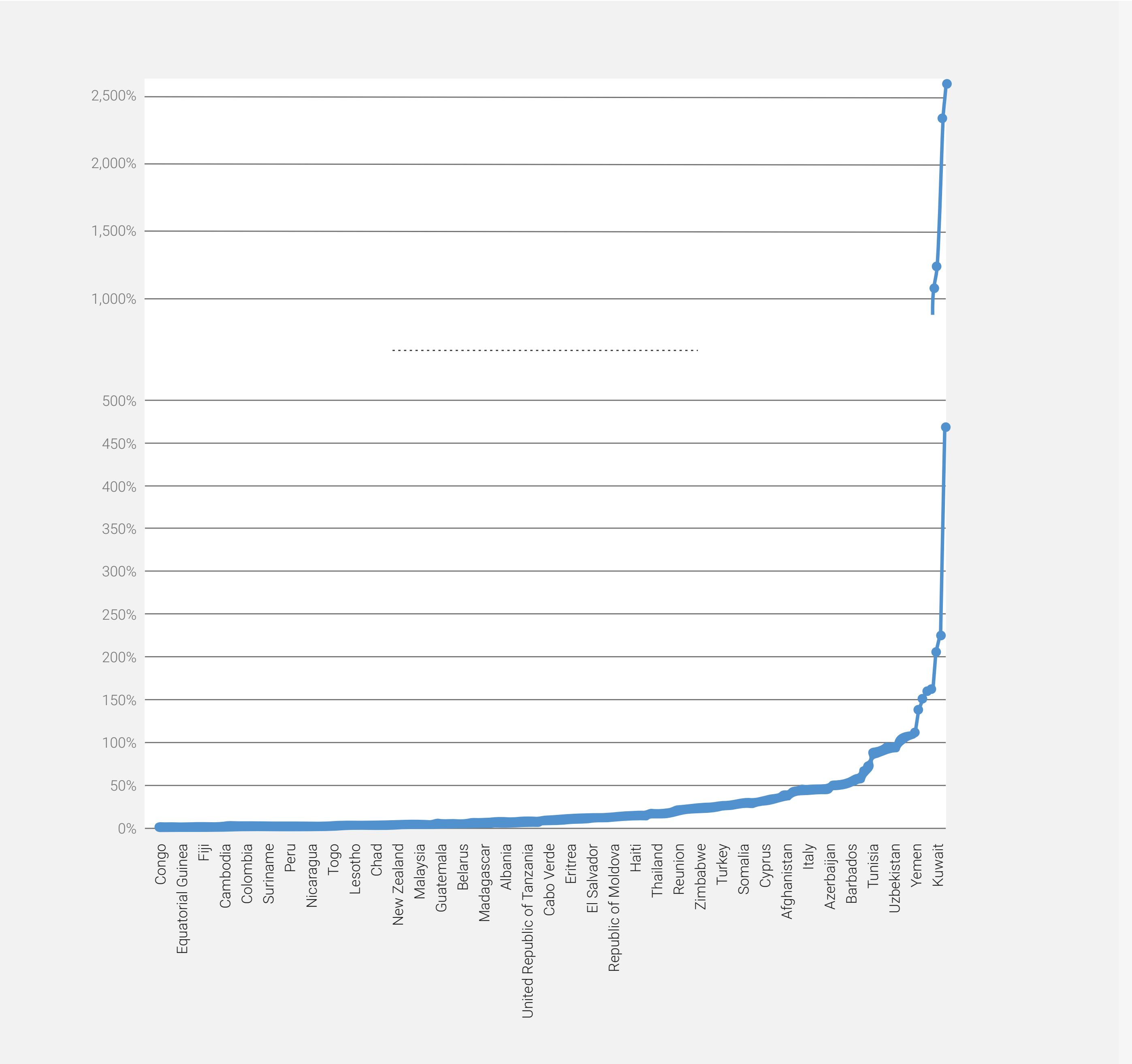


Table 6. Countries according to level of water stress (WS) (2000–2015)

WS (%)	Countries
0–10	**Number of countries: 94** Albania, Angola, Antigua and Barbuda, Argentina, Australia, Austria, Bangladesh, Belarus, Belize, Benin, Bermuda, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Burkina Faso, Burundi, Côte d'Ivoire, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, Colombia, Comoros, Congo, Costa Rica, Croatia, Democratic Republic of the Congo, Djibouti, Ecuador, Equatorial Guinea, Fiji, Gabon, Gambia, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Honduras, Hungary, Iceland, Indonesia, Ireland, Lao People's Democratic Republic, Latvia, Lesotho, Liberia, Lithuania, Luxembourg, Madagascar, Malaysia, Mali, Mongolia, Mozambique, Myanmar, Namibia, Nepal, New Zealand, Nicaragua, Niger, Nigeria, Norway, Panama, Papua New Guinea, Paraguay, Peru, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Senegal, Serbia, Sierra Leone, Slovakia, Slovenia, South Sudan, Suriname, Sweden, Switzerland, Togo, Uganda, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, Uruguay, Venezuela (Bolivarian Republic of), Zambia
10–25	**Number of countries: 32** Czechia, Democratic People's Republic of Korea, Denmark, Dominica, El Salvador, Eritrea, Estonia, Ethiopia, Finland, France, Greece, Haiti, Jamaica, Kenya, Malawi, Maldives, Mauritania, Netherlands, Portugal, Puerto Rico, Republic of Moldova, Reunion, Saint Lucia, Saint Vincent and the Grenadines, Thailand, the former Yugoslav Republic of Macedonia, Timor-Leste, Trinidad and Tobago, Ukraine, United States of America, Viet Nam, Zimbabwe
25–70	**Number of countries: 32** Afghanistan, Armenia, Azerbaijan, Belgium, Bulgaria, China, Cuba, Cyprus, Dominican Republic, Eswatini, Germany, India, Italy, Japan, Kazakhstan, Kyrgyzstan, Lebanon, Malta, Mauritius, Mexico, Morocco, Palestine, Philippines, Poland, Republic of Korea, Saint Kitts and Nevis, Singapore, Somalia, South Africa, Spain, Sri Lanka, Turkey
70–100	**Number of countries: 7** Algeria, Barbados, Iran (Islamic Republic of), Iraq, Sudan, Tajikistan, Tunisia
100–1,000	**Number of countries: 11** Bahrain, Egypt, Israel, Jordan, Oman, Pakistan, Qatar, Syrian Arab Republic, Turkmenistan, Uzbekistan, Yemen
1,000+	**Number of countries: 4** Kuwait, Libya, Saudi Arabia, United Arab Emirates

BOX 5

Global and regional values of water stress

There are different ways of calculating global and regional values of water stress.

The first, and most intuitive, is to find the average using each country's figure for water stress (WS). For instance, if water stress is 20 per cent for country 1 and 40 per cent for country 2, the average would be 30 per cent (Example A below). However, this calculation method does not consider the relative volume of the water resources or the different amounts of water withdrawal in each country within a region/worldwide.

An alternative method is to apply the formula for water stress using the regional/global totals for each of the variables considered (TFWW, TRWR and EFR). Using countries 1 and 2 as an example again, this would give an average of 36 per cent (Example B) or 24 per cent (Example C), as opposed to the 30 per cent in Example A.

	Example A	Example B				Example C			
	WS (%)	TFWW (km^3)	TFWR (km^3)	EFR (km^3)	**WS (%)**	TFWW (km^3)	TFWR (km^3)	EFR (km^3)	**WS (%)**
Country 1	20	2	13	3	**20**	2	13	3	**20**
Country 2	40	16	46	6	**40**	1.6	4.6	0.6	**40**
Average or Total	30	18	59	9	**36**	3.6	17.6	3.6	**24**

The table illustrates that two types of countries with different values for aggregated water stress appear to have the same value if the average is considered, rather than a proper computation of aggregated variables.

In other words, averages conceal the actual differences between the countries, and so provide misleading information to policy- and decision makers. For this reason, the values shown in Figure 2 have been calculated from aggregated variables. They are not averages of the countries in each group.

The system of averages does, however, remain a useful analysis (for long-term trends) and control tool as it gives the same weight to all the elements of the averaged group, being sensitive to changes even in the lesser ones.

3.2. Considerations about data availability at the global level

The FAO database, AQUASTAT, was used to obtain figures for countries all over the world. It can provide figures for two of the three main variables in the methodology – TRWR and TFWW. Although data for some countries are not up to date, AQUASTAT has reliable figures for 180 countries. Some small countries did not have any data in the database, but these would have had little impact on regional/global values (Annex 1).

As for EFR, figures at the country level were taken from the IWMI Water Data Portal that has figures for 166 countries. However, countries can assess their own EFR based on the more detailed knowledge they have of their natural and social conditions, taking into account factors such as the level of development, population density, availability of non-conventional water sources, specific ecosystem needs and climatic conditions.

Next steps in global data collection

As explained in Box 3, to date, the IAEG-SDG has not defined a framework for data collection on global indicators to provide guidance to Member States and custodian agencies alike – the only clear indication being that countries should retain ownership of their data and of the monitoring process in general. As described above, given the difficulties of collecting specific data for certain countries, data available within recognized international data sets have been used to compile the baseline global indicators that are the subject of this report.

To make this process more robust for subsequent rounds of data collection, two main steps will be undertaken:

1. By the end of 2018, pre-populated data-collection sheets will be sent to all Member States, asking them to revise, confirm or update the data. This will reinforce data ownership and shift the responsibility for the data quality towards the countries themselves.

2. The AQUASTAT database will be revamped at the end of the current process. This will involve the establishment of a network of national correspondents who will ensure continuity and consistency in the production of the relevant data in their respective countries.

BOX 6

AQUASTAT database

AQUASTAT is the FAO global water information system, developed by the Land and Water Division. It collects, analyses and disseminates data and information by country on water resources, water uses and agricultural water management.

As AQUASTAT is a repository for data reported by countries, it does not produce new data. The information published relies largely on national capacities and expertise; without individual country efforts, the data stored here are not updated, and consequently cannot be used for monitoring. The information management process comprises:

- A review of literature and information at the country and sub-country level.
- Country surveys through national correspondents, consisting of data collection and country descriptions by means of a detailed questionnaire, in which the data source and metadata are cited for each data point.
- Critical analysis of information and data processing, with preference given to national sources and expert knowledge.
- Verification and validation of transboundary water data considering all countries associated with the transboundary river basin.
- Data modelling by means of a Geographic Information System (GIS) and water balance models for estimating unavailable data and providing spatial data. GIS and remote sensing data are important inputs, together with data acquired through country surveys, which are also used for model calibration.
- Quality checks and standardization of information, data tables and charts.
- Requesting feedback and approval from various national authorities and institutions and responding to comments raised by experts.
- Dissemination of information through the AQUASTAT website in the form of published reports and/or digital products.[5]
- Incorporation of voluntary feedback from users and through cooperation with other institutions.

[5] http://www.fao.org/nr/water/aquastat/main/index.stm

4

Conclusions

Nile bankment in Masindi, Uganda. Photo: Floschen/Creative Commons

Summary of findings

The methodology and the pilot process

SDG indicator 6.4.2 has evolved from the water stress indicator related to MDG target 7.A (Proportion of total water resources used), to take into consideration EFR. The calculation of indicator 6.4.2 is the ratio between TFWW by all major sectors and TRWR, after taking into account EFR.

Having evolved from the MDG indicator, the SDG indicator methodology was already familiar to countries, and most of the data were accessible from country-specific institutions. Information was also available from AQUASTAT, although not for **EFR**. As such, estimating EFR was the main problem area for countries when applying the methodology. None of the countries had undertaken studies on this, except for Uganda, which had some figures from the Environmental Flow Manual prepared for the Nile Basin Initiative project. In the case of Jordan, the estimation was made based on the water pumped to preserve the Azraq oasis. As for Peru and Senegal, they used IWMI estimations at the national level from the IWMI Global Assessment of Environmental Flows and Scarcity. The Netherlands considered three different international models to estimate their environmental flows.

Some data gaps were found for **TRWR** and **TFWW,** mainly on water withdrawals by specific sectors in a couple of countries. These gaps were filled using data from AQUASTAT or other international sources. For the Netherlands, statistical data could also be complemented with remote sensing and modelled data to provide a better spatial and temporal resolution (for example, interpolating precipitation values over the country's surface using radar measurements). Data were generally provided at the national level, except for by Peru and the Netherlands, which provided figures at the basin level. The Netherlands also has statistical data at the subnational level.

Even though sources of data were mostly available, certain challenges were encountered that should be taken into account when collecting the data:

- **Lack of EFR data**. None of the pilot countries had statistical data or had developed an in-country study to be able to draw their own figure for this variable. This seems to be the case for most of the countries in the world. However, free, online data sets are available at the international level, such as the IWMI *Global Assessment of Environmental Flows and Scarcity*. As such, countries can assess their own EFR according to the more detailed knowledge they have of their natural and social conditions.

- **Data inconsistency among various sources.** The availability of different information sources for the same variable was sometimes problematic since figures could vary depending on the source consulted (due to years of reference considered or other components taken into account). To address this challenge in future, the factors that caused the differences must be understood and the data harmonized, or the value with the reference that best matches the definition stated in the indicator's methodology must be selected. It is also important to keep the same data source over time.

- **Weak monitoring by country institutions**. While data were generally available, they were not always in the format, quality, quantity and frequency required. In other cases, certain parameters were being poorly monitored, if not at all. There is the need to strengthen countries' capacities and to mobilize resources to implement the methodology, and to improve cooperation, coordination and sharing of responsibilities and information among the institutions involved in monitoring the indicator.

- **Reference years/periods**. Although data were generally up to date, reference years or periods varied between variables and countries. In this regard, it is essential to always indicate the reference years used.

- **Outdated data**. In the event that data are not available (from in-country or international sources), significant efforts should be made to provide the most accurate estimate possible.

- **Weak reporting from country institutions into international databases**. It was noted that international databases such as AQUASTAT, which serve as repositories for data provided by countries, did not always have the latest figures available. Countries should therefore make efforts to share their data with these international sources so they are up to date as well.

[5] http://www.fao.org/nr/water/aquastat/main/index.stm

- **Double counting.** There was a potential risk of counting a value more than once when computing water withdrawals by the different sectors.

To implement and test the methodology, all pilot countries established working groups with relevant stakeholders to share findings and validate the data and analysis conducted. A national institution was identified to lead the process of coordinating the work and compiling the indicator. Said institution led the review of all national, subnational and basin unit relevant data sources, such as maps, reports, yearbooks and articles. The data collection focused on the most recent data, but without excluding any potential sources of information. Partial data (with respect to time or area), such as data produced by local projects, were also collected. Meetings with all the institutions involved were held throughout 2016 to track progress, share findings and validate the results obtained.

Global data

The world's average water stress stands at almost 13 per cent, although there are significant differences among world regions, which a global assessment hides. For example, sub-Saharan Africa has a low level of water stress (3 per cent), whereas in Northern Africa and Western Asia, it is very high (72 per cent). In a similar vein, regional averages mask realities at the country level. For instance, within the Northern Africa and Western Asia region, some of the countries in the Arabian Peninsula can reach water stress values of over 1,000 per cent.

Water stress affects countries on every continent and hinders the sustainability of natural resources, as well as economic and social development. There are 32 countries experiencing water stress between 25 and 70 per cent, 22 countries are above 70 per cent and are considered to be seriously stressed. Moreover, 15 countries are above 100 per cent, four of which have water stress above 1,000 per cent. These countries – Kuwait, Libya, Saudi Arabia and the United Arab Emirates – largely meet the demand for water using desalination.

The FAO database, AQUASTAT, was able to provide figures for two of the three main variables in the methodology – TRWR and TFWW. Although data for some countries were not up to date, AQUASTAT had reliable figures for 180 countries. Some small countries were not included due to lack of data, however these would have had little impact on regional/global values.

EFR figures at the country level were taken from the IWMI database, containing data for 166 countries. For the remaining 14 countries, mostly small island states, no EFR were applied. Over time, countries should determine their own EFR on a case-by-case basis, taking into account factors such as the level of development, population density, availability of non-conventional water sources, specific ecosystem needs and climatic conditions.

BOX 7
Using indicator 6.4.2 to achieve SDG 6 at the national level

Indicator 6.4.2 is useful for policymaking as it highlights those regions under high water stress, thereby informing countries on where they need to make efforts to improve water resource usage and promote water saving.

Low water stress indicates minimal potential impact on resource sustainability and on potential competition among users. High water stress, on the contrary, indicates substantial use of water resources, with greater impacts on resource sustainability and the potential for conflict among users.

To achieve SDG target 6.4, countries will need to make the best use of their available water resources. In many developing countries, agriculture is by far the largest user, and therefore offers the greatest opportunities for reducing withdrawals and saving water. Even minimal savings in this sector could significantly alleviate water stress in other sectors, particularly in arid countries where agriculture accounts for 90 per cent of freshwater withdrawals. Agricultural water-savings can take many forms, including more sustainable and efficient food production ("more crop per drop"), through sustainable water management practices and technologies, and reducing freshwater withdrawals by growing a smaller amount of water-intensive crops in water-scarce regions. Reducing losses in municipal distribution networks, industrial and energy cooling processes can also make a difference. In addition to this, using treated wastewater and desalinated water can reduce pressure on freshwater resources.

The pilot process conducted in Peru showed that interpretation of this indicator would be enhanced by conducting a deeper analysis at the basin and regional level as this would provide a better picture of water stress distribution within a country, and therefore help to assess where to target more efforts.

Recommendations and next steps

The initial baseline for this indicator has been calculated using data from existing data sets, such as those provided by AQUASTAT and IWMI. However, to fully comply with the ownership criteria of the SDG process, starting from 2019, data will either be directly collected by or crosschecked with each country, in one of two ways: (1) FAO compiles the data and shares them with the Government for endorsement or (2) countries send the data directly to the FAO for compilation and publication.

The further implementation of SDG methodologies requires countries to take ownership of the process and to realize the importance of quality, accessible, timely and reliable disaggregated data for well-informed decision-making. Custodian United Nations organizations need to raise awareness of this, perhaps by means of a communications campaign aimed at the institutions involved, and support countries in this process.

Countries need to have a good understanding of the methodology and be aware of the issues to take into account when using the formula provided. This is also a task for custodian United Nations organizations when explaining the methodology. In this regard, FAO has prepared an online course on indicator 6.4.2 (including quizzes) to make sure the methodology is well communicated and can easily be applied by the country teams.

To enable comparison, it is important that the data provided by countries be accompanied by the relevant metadata, to clarify and record how the information has been obtained, which reference years and units of measurement have been used, etc. To this end, the AQUASTAT questionnaire provides guidance on how to prepare this metadata. FAO also provides countries with a calculation sheet to help ensure consistency when compiling the data.

The pilot process has proven that the monitoring of a given indicator calls for the strengthening of current systems and the involvement of multiple stakeholders and institutions. Countries should appoint a lead institution to coordinate these stakeholders – ideally, an institution related to water or statistics at the national level. The lead institution will play a key role in the process, ensuring that stakeholders have a clear understanding of their role in the process, the actions to be implemented and the support they can provide and receive within said role. Custodian United Nations organizations should focus their efforts on developing strong bonds with these lead institutions.

When estimating EFR, countries should aim to contextualize internationally available data based on the country-specific circumstances, or to undertake their own studies at the national level. Custodian agencies can support this process by providing technical advice and pilot studies could be set up in a few countries.

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ANNEX 1. Country data for the water stress indicator

Country	TRWR		TFWW		EFR	WS
	Year	10^9 m^3/year	Year	10^9 m^3/year	%	%
Afghanistan	2014	65.33	2000	20.28	29	44
Albania	2014	30.2	2006	1.311	33	6
Algeria	2014	11.67	2012	7.81	24	88
Angola	2014	148.4	2005	0.7057	30	1
Antigua and Barbuda	2014	0.052	2012	0.0044	-	8
Argentina	2014	876.2	2011	37.69	35	7
Armenia	2014	7.769	2015	3.272	36	66
Australia	2014	492	2015	16.76	26	5
Austria	2014	77.7	2010	3.492	41	8
Azerbaijan	2014	34.68	2012	11.97	35	53
Bahrain	2014	0.116	2003	0.2387	-	206
Bangladesh	2014	1,227	2008	35.87	23	4
Barbados	2014	0.08	2005	0.07	-	88
Belarus	2014	57.9	2013	1.514	42	5
Belgium	2014	18.3	2009	6.002	42	56
Belize	2014	21.73	2000	0.101	32	1
Benin	2014	26.39	2001	0.13	30	1
Bermuda	2014	0.125	2009	0.0053	-	4
Bhutan	2014	78	2008	0.3379	23	1
Bolivia (Plurinational State of)	2014	574	2009	2.088	31	1
Bosnia and Herzegovina	2014	37.5	2013	0.3279	39	1
Botswana	2014	12.24	2000	0.194	24	2
Brazil	2014	8,647	2010	74.78	35	1
Brunei Darussalam	2014	8.5	1994	0.092	42	2
Bulgaria	2014	21.3	2015	5.629	37	42
Burkina Faso	2014	13.5	2005	0.818	36	9
Burundi	2014	12.54	2000	0.288	26	3

Cabo Verde	2014	0.3	2001	0.0203	25	9
Cambodia	2014	476.1	2006	2.184	25	1
Cameroon	2014	283.1	2000	0.9664	28	0
Canada	2014	2,902	2009	38.8	39	2
Central African Republic	2014	141	2005	0.0725	26	0
Chad	2014	45.7	2005	0.8796	21	2
Chile	2014	923.1	2006	35.36	30	5
China	2014	2,840	2015	594.2	29	29
Colombia	2014	2,360	2008	11.77	42	1
Comoros	2014	1.2	1999	0.01	29	1
Congo	2014	832	2002	0.046	40	0
Costa Rica	2014	113	2013	2.347	32	3
Côte d'Ivoire	2014	84.14	2005	1.549	32	3
Croatia	2014	105.5	2013	0.6338	39	1
Cuba	2014	38.12	2013	6.959	29	26
Cyprus	2014	0.78	2013	0.2218	24	38
Czechia	2014	13.15	2013	1.65	48	24
Democratic People's Republic of Korea	2014	77.15	2005	8.658	30	16
Democratic Republic of the Congo	2014	1,283	2005	0.6836	41	0
Denmark	2014	6	2012	0.637	49	21
Djibouti	2014	0.3	2000	0.0188	21	8
Dominica	2014	0.2	2010	0.02	-	10
Dominican Republic	2014	23.5	2010	7.137	31	44
Ecuador	2014	442.4	2005	9.916	40	4
Egypt	2014	58.3	2010	73.8	21	160
El Salvador	2014	26.27	2005	2.118	29	11
Equatorial Guinea	2014	26	2000	0.0174	34	0
Eritrea	2014	7.315	2004	0.582	21	10
Estonia	2014	12.81	2014	1.72	40	22
Eswatini	2014	4.51	2000	1.042	29	32
Ethiopia	2014	122	2016	10.55	25	12
Fiji	2014	28.55	2005	0.0849	34	0
Finland	2014	110	2006	6.562	43	10
France	2014	211	2012	29.81	38	23

Gabon	2014	166	2005	0.1391	31	0
Gambia	2014	8	2000	0.0905	22	1
Georgia	2014	63.33	2008	1.823	37	5
Germany	2014	154	2010	32.99	48	41
Ghana	2014	56.2	2000	0.982	37	3
Greece	2014	68.4	2007	9.593	29	20
Grenada	2014	0.2	2014	0.0141	-	7
Guatemala	2014	127.9	2006	3.324	31	4
Guinea	2014	226	2001	0.5533	25	0
Guinea-Bissau	2014	31.4	2000	0.175	22	1
Guyana	2014	271	2010	1.445	38	1
Haiti	2014	14.03	2009	1.45	34	16
Honduras	2014	92.16	2003	1.607	30	2
Hungary	2014	104	2012	5.051	41	8
Iceland	2014	170	2015	0.2783	33	0
India	2014	1,911	2010	647.5	24	45
Indonesia	2014	2,019	2000	113.3	39	9
Iran (Islamic Republic of)	2014	137	2004	93.1	24	90
Iraq	2014	89.86	2000	65.99	21	93
Ireland	2014	52	2009	0.757	39	2
Israel	2014	1.78	2004	1.419	28	110
Italy	2014	191.3	2008	53.75	37	45
Jamaica	2014	10.82	2007	0.8115	34	11
Japan	2014	430	2009	81.22	34	28
Jordan	2014	0.937	2015	1.104	22	151
Kazakhstan	2014	108.4	2010	19.98	35	28
Kenya	2014	30.7	2010	3.218	27	14
Kuwait	2014	0.02	2002	0.415	20	2,603
Kyrgyzstan	2014	23.62	2006	7.707	26	44
Lao People's Democratic Republic	2014	333.5	2005	3.493	25	1
Latvia	2014	34.94	2013	0.236	39	1
Lebanon	2014	4.503	2005	1.096	27	33
Lesotho	2014	3.022	2000	0.0438	32	2
Liberia	2014	232	2000	0.1308	29	0
Libya	2014	0.7	2012	5.76	23	1,072
Lithuania	2014	24.5	2011	0.6264	36	4
Luxembourg	2014	3.5	2013	0.0431	50	2

Madagascar	2014	337	2006	13.56	30	6
Malawi	2014	17.28	2005	1.357	29	11
Malaysia	2014	580	2005	11.2	43	3
Maldives	2014	0.03	2008	0.0047	-	16
Mali	2014	120	2006	5.186	26	6
Malta	2014	0.0505	2013	0.0224	-	44
Mauritania	2014	11.4	2005	1.348	25	16
Mauritius	2014	2.751	2003	0.725	-	26
Mexico	2014	461.9	2015	85.66	29	26
Mongolia	2014	34.8	2009	0.551	35	2
Morocco	2014	29	2010	10.35	27	49
Mozambique	2014	217.1	2015	1.473	27	1
Myanmar	2014	1,168	2000	33.23	23	4
Namibia	2014	39.91	2002	0.2819	24	1
Nepal	2014	210.2	2006	9.497	23	6
Netherlands	2014	91	2012	10.72	44	21
New Zealand	2014	327	2010	5.201	42	3
Nicaragua	2014	164.5	2011	1.545	30	1
Niger	2014	34.05	2005	0.9836	23	4
Nigeria	2014	286.2	2010	12.47	25	6
Norway	2014	393	2007	3.026	33	1
Oman	2014	1.4	2003	1.186	20	106
Pakistan	2014	246.8	2008	183.5	27	103
Palestine	2014	0.837	2005	0.408	-	49
Panama	2014	139.3	2010	1.037	29	1
Papua New Guinea	2014	801	2005	0.3921	44	0
Paraguay	2014	387.8	2012	2.413	33	1
Peru	2014	1,880	2008	13.56	38	1
Philippines	2014	479	2009	81.56	32	25
Poland	2014	60.5	2012	11.47	50	38
Portugal	2014	77.4	2007	9.146	31	17
Puerto Rico	2014	7.1	2010	1.017	33	21
Qatar	2014	0.058	2005	0.217	21	473
Republic of Korea	2014	69.7	2005	29.04	28	58
Republic of Moldova	2014	12.27	2007	1.065	34	13
Reunion	2014	5	2007	0.7833	30	22
Romania	2014	212	2013	6.418	41	5

Russian Federation	2014	4,525	2013	61	33	2
Rwanda	2014	13.3	2000	0.15	22	1
Saint Kitts and Nevis	2014	0.024	2012	0.0123	-	51
Saint Lucia	2014	0.3	2007	0.0429	-	14
Saint Vincent and the Grenadines	2014	0.1	2013	0.0079	29	11
Sao Tome and Principe	2014	2.18	1993	0.007	30	0
Saudi Arabia	2014	2.4	2006	22.64	24	1,243
Senegal	2014	38.97	2002	2.221	21	7
Serbia	2014	162.2	2013	4.15	40	4
Sierra Leone	2014	160	2005	0.2122	25	0
Singapore	2014	0.6	1975	0.19	-	32
Slovakia	2014	50.1	2014	0.5593	42	2
Slovenia	2014	31.87	2013	1.156	41	6
Somalia	2014	14.7	2003	3.298	26	30
South Africa	2014	51.35	2013	15.5	30	43
South Sudan	2014	49.5	2011	0.658	-	1
Spain	2014	111.5	2012	36.75	34	50
Sri Lanka	2014	52.8	2005	12.95	28	34
Sudan	2014	37.8	2011	26.93	24	94
Suriname	2014	99	2006	0.6159	35	1
Sweden	2014	174	2010	2.689	46	3
Switzerland	2014	53.5	2012	2.005	49	7
Syrian Arab Republic	2014	16.8	2005	14.14	23	109
Tajikistan	2014	21.91	2006	11.19	28	71
Thailand	2014	438.6	2007	57.31	25	17
The former Yugoslav Republic of Macedonia	2014	6.4	2007	0.5512	35	13
Timor-Leste	2014	8.215	2004	1.172	-	14
Togo	2014	14.7	2002	0.169	35	2
Trinidad and Tobago	2014	3.84	2011	0.3362	29	12
Tunisia	2014	4.615	2011	3.217	26	94
Turkey	2014	211.6	2008	41.96	28	27
Turkmenistan	2014	24.77	2004	27.87	31	163
Uganda	2014	60.1	2008	0.637	20	1

Ukraine	2014	175.3	2010	14.85	39	14
United Arab Emirates	2014	0.15	2005	2.8	20	2,346
United Kingdom of Great Britain and Northern Ireland	2014	147	2012	8.017	44	10
United Republic of Tanzania	2014	96.27	2002	5.184	28	7
United States of America	2014	3,069	2010	418.7	40	23
Uruguay	2014	172.2	2000	3.66	40	4
Uzbekistan	2014	48.87	2005	49.16	28	139
Venezuela (Bolivarian Republic of)	2014	1,325	2007	22.62	34	3
Viet Nam	2014	884.1	2005	81.86	28	13
Yemen	2014	2.1	2005	3.54	26	228
Zambia	2014	104.8	2002	1.572	30	2
Zimbabwe	2014	20	2007	3.57	27	24

ANNEX 2. Countries in regions

The countries included in the global analysis of indicator 6.4.2 are listed by region in the following tables.

Africa				
	Sub-Saharan Africa			
	Eastern Africa	Middle Africa	Western Africa	Southern Africa
Algeria	Burundi	Angola	Benin	Botswana
Egypt	Comoros	Cameroon	Burkina Faso	Eswatini
Libya	Djibouti	Central African Republic	Cabo Verde	Lesotho
Morocco	Eritrea	Chad	Côte d'Ivoire	Namibia
Sudan	Ethiopia	Congo	Gambia	South Africa
Tunisia	Kenya	Democratic Republic of the Congo	Ghana	
	Madagascar	Equatorial Guinea	Guinea	
	Malawi	Gabon	Guinea-Bissau	
	Mauritius	Sao Tome and Principe	Liberia	
	Mozambique		Mali	
	Rwanda		Mauritania	
	Seychelles		Niger	
	Somalia		Nigeria	
	Uganda		Senegal	
	United Republic of Tanzania		Sierra Leone	
	Zambia		Togo	
	Zimbabwe			

Americas			
Northern America	Latin America and the Caribbean		
	Caribbean	Central America	South America
Canada	Antigua and Barbuda	Belize	Argentina
United States of America	Bahamas	Costa Rica	Bolivia (Plurinational State of)
	Barbados	El Salvador	Brazil
	Cuba	Guatemala	Chile
	Dominica	Honduras	Colombia
	Dominican Republic	Mexico	Ecuador
	Grenada	Nicaragua	Guyana
	Haiti	Panama	Paraguay
	Jamaica		Peru
	Puerto Rico		Suriname
	Saint Kitts and Nevis		Uruguay
	Saint Lucia		Venezuela (Bolivarian Republic of)
	Saint Vincent and the Grenadines		
	Trinidad and Tobago		

Europe			
Northern Europe	Eastern Europe	Western Europe	Southern Europe
Denmark	Belarus	Austria	Albania
Estonia	Bulgaria	Belgium	Andorra
Finland	Czechia	France	Bosnia and Herzegovina
Iceland	Hungary	Germany	Croatia
Ireland	Poland	Luxembourg	Greece
Latvia	Republic of Moldova	Monaco	Italy
Lithuania	Romania	Netherlands	Malta
Norway	Russian Federation	Switzerland	Montenegro
Sweden	Slovakia		Portugal
United Kingdom of Great Britain and Northern Ireland	Ukraine		San Marino
			Serbia
			Slovenia
			Spain
			The former Yugoslav Republic of Macedonia

Asia				
Central Asia	**Eastern Asia**	**Southern Asia**	**South-Eastern Asia**	**Western Asia**
Kazakhstan	China	Afghanistan	Brunei Darussalam	Armenia
Kyrgyzstan	Democratic People's Republic of Korea	Bangladesh	Cambodia	Azerbaijan
Tajikistan	Japan	Bhutan	Indonesia	Bahrain
Turkmenistan	Mongolia	India	Lao People's Democratic Republic	Cyprus
Uzbekistan	Republic of Korea	Iran (Islamic Republic of)	Malaysia	Georgia
		Maldives	Myanmar	Iraq
		Nepal	Philippines	Israel
		Pakistan	Singapore	Jordan
		Sri Lanka	Thailand	Kuwait
			Timor-Leste	Lebanon
			Viet Nam	Oman
				Palestine
				Qatar
				Saudi Arabia
				Syrian Arab Republic
				Turkey
				United Arab Emirates
				Yemen

Oceania			
Australia and New Zealand	**Melanesia**	**Micronesia**	**Polynesia**
Australia	Fiji	Kiribati	Cook Islands
New Zealand	Papua New Guinea	Marshall Islands	Niue
	Solomon Islands	Micronesia (Federal States of)	Samoa
	Vanuatu	Nauru	Tonga
		Palau	Tuvalu

ANNEX 3. International Standard Industrial Classification of All Economic Activities (ISIC), Rev.4

ISIC Activity	AW	IW	SW
A – Agriculture, forestry and fishing 01 – Crop and animal production, hunting and related service activities	X		
02 – Forestry and logging	–		
03(1) – Fishing	–		
03(2) – Aquaculture	X		
B (05–09) – Mining and quarrying C (10–33) – Manufacturing D (35) – Electricity, gas, steam and air conditioning supply		X	
E – Water supply; sewerage, waste management and remediation activities 36 – Water collection, treatment and supply			X
37 – Sewerage 38 – Waste collection, treatment and disposal activities; materials recovery 39 – Remediation activities and other waste management services			–
F (41–43) – Construction		X	
G (45–47) – Wholesale and retail trade; repair of motor vehicles and motorcycles H (49–53) – Transportation and storage I (55–56) – Accommodation and food service activities J (58–63) – Information and communication K (64–66) – Financial and insurance activities L (68) – Real estate activities M (69–75) – Professional, scientific and technical activities N (77–82) – Administrative and support service activities O (84) – Public administration and defence; compulsory social security P (85) – Education Q (86–88) – Human health and social work activities R (90–93) – Arts, entertainment and recreation S (94–96) – Other service activities T (97–98) – Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use			–
U (99) – Activities of extraterritorial organizations and bodies	–	–	–

LEARN MORE ABOUT PROGRESS TOWARDS SDG 6

6 CLEAN WATER AND SANITATION

SDG 6 expands the 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.

The monitoring of progress towards SDG 6 is a means to making this happen. High-quality data help policy- 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.

In 2016–2018, following the adoption of the global indicator framework, the UN-Water Integrated Monitoring Initiative focused on establishing the global baseline for all SDG 6 global indicators, which is essential for effective follow-up and review of progress towards SDG 6. Below is an overview of the resultant indicator reports produced in 2017–2018. UN-Water has also produced the SDG 6 Synthesis Report 2018 on Water and Sanitation, which, building on baseline data, addresses the cross-cutting nature of water and sanitation and the many interlinkages within SDG 6 and across the 2030 Agenda, and discusses ways to accelerate progress towards SDG 6.

Progress on Drinking Water, Sanitation and Hygiene – 2017 Update and SDG Baselines (including data on SDG indicators 6.1.1 and 6.2.1) By WHO and UNICEF	One of the most important uses of water is for drinking and hygiene purposes. A safely managed sanitation chain is essential to protecting the health of individuals and communities and the environment. By monitoring use of drinking water and sanitation services, policy- and decision makers can find out who has access to safe water and a toilet with handwashing facilities at home, and who requires it. Learn more about the baseline situation for SDG indicators 6.1.1 and 6.2.1 here: http://www.unwater.org/publication_categories/whounicef-joint-monitoring-programme-for-water-supply-sanitation-hygiene-jmp/.
Progress on Safe Treatment and Use of Wastewater – Piloting the monitoring methodology and initial findings for SDG indicator 6.3.1 By WHO and UN-Habitat on behalf of UN-Water	Leaking latrines and raw wastewater can spread disease and provide a breeding ground for mosquitoes, as well as pollute groundwater and surface water. Learn more about wastewater monitoring and initial status findings here: http://www.unwater.org/publications/progress-on-wastewater-treatment-631.
Progress on Ambient Water Quality – Piloting the monitoring methodology and initial findings for SDG indicator 6.3.2 By UN Environment on behalf of UN-Water	Good ambient water quality ensures the continued availability of important freshwater ecosystem services and does not negatively affect human health. Untreated wastewater from domestic sources, industry and agriculture can be detrimental to ambient water quality. Regular monitoring of freshwaters allows for the timely response to potential sources of pollution and enables stricter enforcement of laws and discharge permits. Learn more about water quality monitoring and initial status findings here: http://www.unwater.org/publications/progress-on-ambient-water-quality-632.
Progress on Water-Use Efficiency – Global baseline for SDG indicator 6.4.1 By FAO on behalf of UN-Water	Freshwater is used by all sectors of society, with agriculture being the biggest user overall. The global indicator on water-use efficiency tracks to what extent a country's economic growth is dependent on the use of water resources, and enables policy- and decision makers to target interventions at sectors with high water use and low levels of improved efficiency over time. Learn more about the baseline situation for SDG indicator 6.4.1 here: http://www.unwater.org/publications/progress-on-water-use-efficiency-641.

Progress on Level of Water Stress – Global baseline for SDG indicator 6.4.2 By FAO on behalf of UN-Water	A high level of water stress can have negative effects on economic development, increasing competition and potential conflict among users. This calls for effective supply and demand management policies. Securing environmental water requirements is essential to maintaining ecosystem health and resilience. Learn more about the baseline situation for SDG indicator 6.4.2 here: http://www.unwater.org/publications/progress-on-level-of-water-stress-642.
Progress on Integrated Water Resources Management – Global baseline for SDG indicator 6.5.1 By UN Environment on behalf of UN-Water	Integrated water resources management (IWRM) is about balancing the water requirements of society, the economy and the environment. The monitoring of 6.5.1 calls for a participatory approach in which representatives from different sectors and regions are brought together to discuss and validate the questionnaire responses, paving the way for coordination and collaboration beyond monitoring. Learn more about the baseline situation for SDG indicator 6.5.1 here: http://www.unwater.org/publications/progress-on-integrated-water-resources-management-651.
Progress on Transboundary Water Cooperation – Global baseline for SDG indicator 6.5.2 By UNECE and UNESCO on behalf of UN-Water	Most of the world's water resources are shared between countries; where the development and management of water resources has an impact across transboundary basins, cooperation is required. Specific agreements or other arrangements between co-riparian countries are a precondition to ensuring sustainable cooperation. SDG indicator 6.5.2 measures cooperation on both transboundary river and lake basins, and transboundary aquifers. Learn more about the baseline situation for SDG indicator 6.5.2 here: http://www.unwater.org/publications/progress-on-transboundary-water-cooperation-652.
Progress on Water-related Ecosystems – Piloting the monitoring methodology and initial findings for SDG indicator 6.6.1 By UN Environment on behalf of UN-Water	Ecosystems replenish and purify water resources and need to be protected to safeguard human and environmental resilience. Ecosystem monitoring, including that of ecosystem health, highlights the need to protect and conserve ecosystems and enables policy- and decision makers to set de facto management objectives. Learn more about ecosystem monitoring and initial status findings here: http://www.unwater.org/publications/progress-on-water-related-ecosystems-661.
UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) 2017 report – Financing universal water, sanitation and hygiene under the Sustainable Development Goals (including data on SDG indicators 6.a.1 and 6.b.1) By WHO on behalf of UN-Water	Human and financial resources are needed to implement SDG 6, and international cooperation is essential to making it happen. Defining the procedures for local communities to participate in water and sanitation planning, policy, law and management is vital to ensuring that the needs of everyone in the community are met, and to ensuring the long-term sustainability of water and sanitation solutions. Learn more about the monitoring of international cooperation and stakeholder participation here: http://www.unwater.org/publication_categories/glaas/.
SDG 6 Synthesis Report 2018 on Water and Sanitation By UN-Water	This first synthesis report on SDG 6 seeks to inform discussions among Member States during the High-level Political Forum on Sustainable Development in July 2018. It is an in-depth review and includes data on the global baseline status of SDG 6, the current situation and trends at the global and regional levels, and what more needs to be done to achieve this goal by 2030. Read the report here: http://www.unwater.org/publication_categories/sdg-6-synthesis-report-2018-on-water-and-sanitation/.

UN-WATER REPORTS

UN WATER

UN-Water coordinates the efforts of United Nations entities and international organizations working on water and sanitation issues. By doing so, UN-Water seeks to increase the effectiveness of the support provided to Member States in their efforts towards achieving international agreements on water and sanitation. UN-Water publications draw on the experience and expertise of UN-Water's Members and Partners.

PERIODIC REPORTS

Sustainable Development Goal 6 Synthesis Report 2018 on Water and Sanitation

The SDG 6 Synthesis Report 2018 on Water and Sanitation was published in June 2018 ahead of the High-level Political Forum on Sustainable Development, where Member States reviewed SDG 6 in depth. Representing a joint position from the United Nations family, the report offers guidance to understanding global progress on SDG 6 and its interdependencies with other goals and targets. It also provides insight into how countries can plan and act to ensure that no one is left behind when implementing the 2030 Agenda for Sustainable Development.

Sustainable Development Goal 6 Indicator Reports

This series of reports shows the progress towards targets set out in SDG 6 using the SDG global indicators. The reports are based on country data, compiled and verified by the United Nations organizations serving as custodians of each indicator. The reports show progress on drinking water, sanitation and hygiene (WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene for targets 6.1 and 6.2), wastewater treatment and ambient water quality (UN Environment, UN-Habitat and WHO for target 6.3), water-use efficiency and level of water stress (FAO for target 6.4), integrated water resources management and transboundary water cooperation (UN Environment, UNECE and UNESCO for target 6.5), ecosystems (UN Environment for target 6.6) and means for implementing SDG 6 (UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water for targets 6.a and 6.b).

World Water Development Report

This annual report, published by UNESCO on behalf of UN-Water, represents the coherent and integrated response of the United Nations system to freshwater-related issues and emerging challenges. The theme of the report is harmonized with the theme of World Water Day (22 March) and changes annually.

Policy and Analytical Briefs

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

UN-WATER PLANNED PUBLICATIONS 2018

- Update of UN-Water Policy Brief on Water and Climate Change
- UN-Water Policy Brief on the Water Conventions
- UN-Water Analytical Brief on Water Efficiency

More information on UN-Water Reports at www.unwater.org/publications

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 baseline situation for water stress.

More information and the metrological guidance can be found at: www.fao.org/sustainable-development-goals/indicators/642/

This report is part of a series that track 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: www.sdg6monitoring.org

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