SIAP Training Program for Supporting the Monitoring of Sustainable Development Goals (SDGs) 2030 in the Asia Pacific Region

SDG Indicators under FAO Custodianship

Dorian Kalamvrezos Navarro
Programme Advisor, Office of the Chief Statistician

Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

GOAL 6. ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

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

- 6.4.1 Change in water-use efficiency over time (Tier II)
- 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (Tier I)
  - They provide complementary information on the efficiency and sustainability of water use

WATER USE

- Depending on diet, between 2,000 and 5,000 litres of water are needed to produce the food consumed daily by one person
- Crops and livestock account for 70% water withdrawals
- 95% in some developing countries
- Expected to increase as world population growth continues
- 2/3 of the world population could be living in water-stressed countries by 2025 if current consumption patterns continue
- Water particularly critical issue in the Arab region – numerous ESCWA publications focus of water resource management, including a dedicated biennial Water Development Report

SDG INDICATOR 6.4.1
CHANGE IN WATER-USE EFFICIENCY OVER TIME

DEFINITION AND METHOD OF COMPUTATION

- Defined as the output (value added) of a given major industrial sector divided by the volume of water used, measured in USD/ m3
- Water use: water that is directly abstracted or is received by an industry or households from another industry
- Water abstraction: water removed from a river, lake, reservoir or aquifer
- The terms water use and water abstraction are used to maintain consistency the terminology used in SEEA-Water. "Water abstraction" is a synonym of "water withdrawal", as expressed in SDG target 6.4.
- Historical time series needed to measure the trend in water use efficiency over time

MAJOR INDUSTRIAL SECTORS

Three major sectors according to ISIC 4

- Agriculture, forestry and fishing (ISIC 4-A)
  - Only GVA from irrigated agriculture
  - Derived from: Irrigated land area * Ratio between irrigated and crop productivity
- Manufacturing, constructions, mining and quarrying (ISIC B, C, D and F)
- Service sector (ISIC E & ISIC G-T)

METHOD OF COMPUTATION

- The indicator is computed as the weighted average of the water efficiency of the three main economic sectors, with weights given by the share of water withdrawn by each sector over the total withdrawals. In formula:

$$WUE = A_{we} \times P_A + M_{we} \times P_M + S_{we} \times P_S$$

- Indicator is expressed in value/volume, USD/m3 unit

METHOD OF COMPUTATION

- $WUE = A_{we} \times P_A + M_{we} \times P_M + S_{we} \times P_S$

- WUE = Water use efficiency
- A_{we} = Irrigated agriculture water use efficiency [USD/m^3]
- M_{we} = MIMEC water use efficiency [USD/m^3]
- S_{we} = Services water use efficiency [USD/m^3]
- P_A = Proportion of water used by the agricultural sector over the total use
- P_M = Proportion of water used by the MIMEC sector over the total use
- P_S = Proportion of water used by the service sector over the total use

LIMITATIONS

- Water use efficiency strongly influenced by the economic structure of a country (weight of water intensive sectors): comparison of water efficiency across countries of limited value
- Also change in water use efficiency can be influenced by both 'real' improvements, as well as by changes in the economic structure
- Positive trend does not necessarily indicate a decline in total water use: needs to be combined with the water stress indicator (6.4.2)
- More disaggregated data at national level can help better interpreting trends: e.g. water efficiency for energy and for the municipal distribution network; in agriculture, disaggregation for livestock and aquaculture

DATA SOURCE AND DATA COLLECTION

- **Country:** Gross value added of each sector = National Accounts prepared by the NSO or the Central Bank
- **Country:** Volume of water used by each sector = Administrative sources of each relevant Line Ministry
- **Global:** Data on value added is compiled in UNSD's "The National Accounts Main Aggregates Database"
- **Global:** Data on water withdrawal are compiled for many countries in FAO's water database: AQUASTAT
- FAO (through AQUASTAT) calculates the indicator at national, regional and global level on behalf of UN-Water

Country	Last date	6.4.1 (preliminary)
Afghanistan	2002	0.30
Bhutan	2007	3.19
India	2012	1.92
Iran	2007	3.77
Japan	2007	51.51
Lao PDR	2007	1.55
Malaysia	2007	16.85
Maldives	N/A	N/A
Mongolia	2012	13.86
Pakistan	2007	1.03
Papua New Guinea	2007	27.47
Republic of Korea	2002	26.23
Samoa	N/A	N/A
Thailand	2007	5.29
Turkmenistan	2007	0.40
Uzbekistan	2007	0.56

Kenya
Indicator 6.4.1

IRRIGATED AGRICULTURE WATER USE EFFICIENCY (Awe)			UNIT	CALCULATION RULES
Ratio between rainfed and irrigated yields	[1]	0.375	decimals	Default Value used 0.375 default ratio used if no data entered
Proportion of irrigated land on the total arable land (Ai)	[2]	0.019	decimals	=[3]/[4]
Irrigated land	[3]	193600		from Annual Progress report 2016/17 for MTP II
Arable land	[4]	10261582		from NWMP 2030 VOLUME - V SECTORAL REPORT (2/3)
Proportion of agricultural GVA produced by rainfed agriculture (Cr)	[5]	0.951	decimals	=(1/(1+([2]/((1-[2])*[1])))))
Volume of water withdrawn by the agricultural sector (including irrigation, livestock and aquaculture)	[6]	3.234	km^3	From WRA
Gross value added by agriculture (excluding river and marine fisheries and forestry)	[7]	21,767,596,059	USD	from Kenya Economic survey, 2017, KNBS
Irrigated Agriculture Water Use Efficiency	[8]	**0.3283103**	**USD/m^3**	=([7]*(1-[5]))/[6]
MIMEC WATER USE EFFICIENCY (Mwe)		**Total**	**Unit**	
Gross value added by the MIMEC sectors (including energy)	[9]	6,482,266,010	USD	from Kenya Economic survey, 2017, KNBS
Volume of water withdrawn by the MIMEC sectors (including energy)	[10]	0.303	km^3	from WRA
MIMEC Water Use Efficiency	[11]	**21.421**	**USD/m^3**	=[9]/[10]
SERVICES WATER USE EFFICIENCY (Swe)				
Gross value added by services	[12]	29,301,349,754	USD	
Volume of water withdrawn by the services	[13]	0.495	km^3	WRA Data: Services allocation = Public+domestic +other uses categories
Services Water Use Efficiency	[14]	**59.149**	**USD/m^3**	=[12]/[13]
WATER USE EFFICIENCY (WUE)				
Proportion of water withdrawn by the agricultural sector over the total withdrawals	[15]	**0.802**	decimals	=[6]/([6]+[10]+[13])
Proportion of water withdrawn by the MIMEC sector over the total withdrawals	[16]	**0.075**	decimals	=[10]/([6]+[10]+[13])
Proportion of water withdrawn by the service sector over the total withdrawals	[17]	**0.123**	decimals	=[13]/([6]+[10]+[13])
Water Use Efficiency	[18]	**9.138**	**USD/m^3**	=([15]*[8])+([16]*[11])+([17]*[14])

CHARACTERISTICS OF THE AVAILABLE DATA

- The figures are calculated by FAO based on the latest available data on the numerator and the denominator
- They are preliminary data – FAO is working with countries to get updated data series and to validate the old time series for the next reporting
- The data for Asia-Pacific countries is largely outdated – the most recent figures are from 2012
- The sticking point is the denominator: up-to-date water use data are lacking

SDG INDICATOR 6.4.2

LEVEL OF WATER STRESS: FRESHWATER WITHDRAWAL AS A PROPORTION OF AVAILABLE FRESHWATER RESOURCES

CONCEPT AND DEFINITION

- **Concept:** the purpose of this indicator is to assess the degree to which water resources are being used in a sustainable way to meet the country's water demand
- It provides an estimate of pressure by all major economic sectors on the country's renewable freshwater resources
- **Definition:** the ratio between total freshwater abstracted (or withdrawn) by all major sectors and total renewable freshwater resources, after having taken into account environmental water requirements

DEFINITION AND METHOD OF COMPUTATION

- The major sector may be defined as for Indicator 6.4.1 according to ISIC
- Builds on MDG indicator 7.5. New aspect: accounts for environmental water requirements
- Environmental water requirements are established in order to protect the basic environmental services of freshwater ecosystems. They are the minimum *quantities of water required to sustain freshwater and estuarine ecosystems*
- Methods of computation are extremely variable. FAO reccomends the use of International Water Management Institute's (CGIAR) Environmental Flow Calculator: www.iwmi.cgiar.org/resources/models-and-software/environmental-flow-calculators/

DEFINITION AND METHOD OF COMPUTATION

- It is proposed to classify the level of water stress in three main categories (levels): low, high and very high
- **Low stress: 0 – 25%** (A low level of water stress indicates a situation where the combined withdrawal by all sectors is marginal in relation to the resources, and has therefore little potential impact on the sustainability of the resources or on the potential competition between users)
- **High stress: 25 – 70%** (A high level of water stress indicates a situation where the combined withdrawal by all sectors represents a substantial share of the total renewable freshwater resources, with potentially larger impacts on the sustainability of the resources and potential situations of conflicts and competition between users)
- **Very high stress: > 70%**

DEFINITION AND METHOD OF COMPUTATION

- Stress (%) = total freshwater withdrawn / (total renewable freshwater resources - environment) * 100
- Numerator: Total freshwater withdrawn: The volume of freshwater extracted from its source: Rivers, Lakes and Aquifers

For agriculture, industries and municipalities

✓Includes surface freshwater, groundwater and fossil groundwater

✓It does not include direct use of non-conventional water, i.e. treated wastewater, agricultural drainage water, and desalinated water

DEFINITION AND METHOD OF COMPUTATION

- Stress (%) = total freshwater withdrawn / (total renewable freshwater resources - environment) * 100
- Denominator: total renewable freshwater resources: The sum of internal and external renewable water resources
  - ✓ Internal renewable water resources = average annual flow of rivers and recharge of groundwater generated from endogenous precipitations for a given country
  - ✓ External renewable water resources = flow of water entering the country, taking into consideration the flow reserved to upstream and downstream countries through agreements or treaties

INDICATOR LIMITATIONS

- Difficulty to obtain accurate, complete and up-to-date data
- The indicator does not account for seasonal variations in water resources
- The indicator does not capture water stress variations at sub-national level, which can potentially be significant

INDICATOR LIMITATIONS

- The indicator can be higher than 100% when water withdrawal includes:

✓ secondary freshwater (water withdrawn previously and returned to the system)

✓ non-renewable water (fossil groundwater)

✓ when annual groundwater withdrawal is higher than annual replenishment (over-abstraction)

✓ when water withdrawal includes part or all of the water set aside for environmental water requirements.

DATA COLLECTION (PAST)

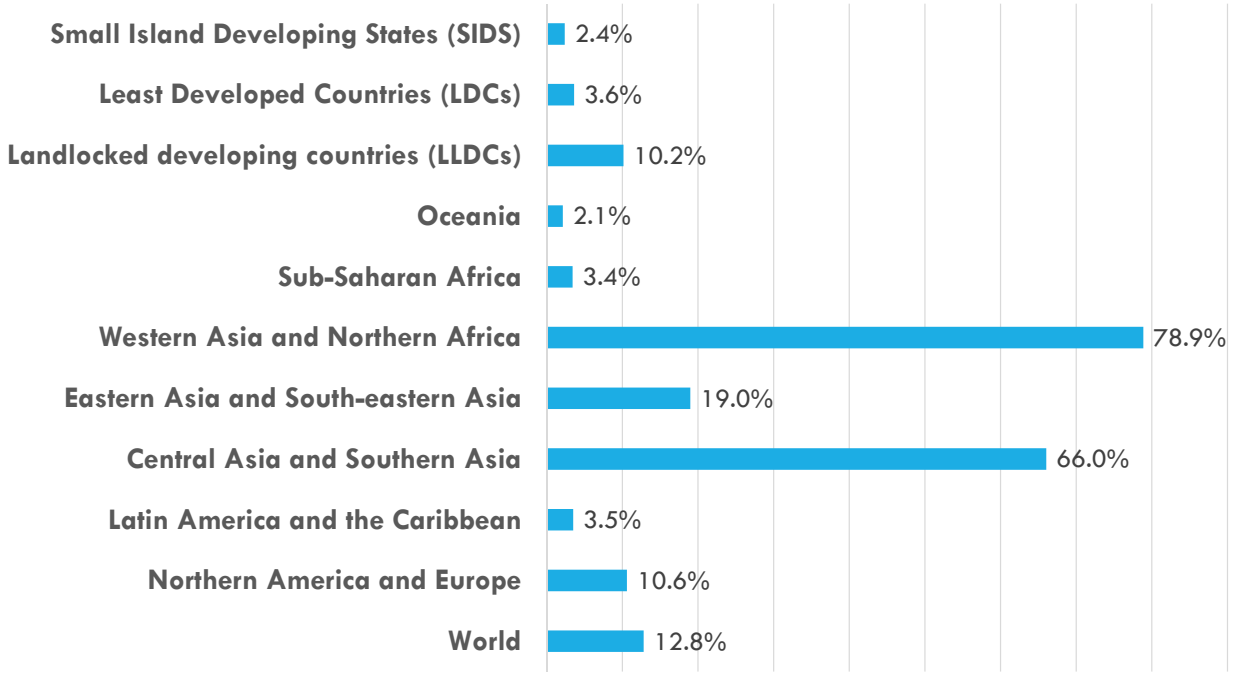
- Usually, three-five years are a minimum frequency to be able to detect significant changes
- Few countries actually publish water use data on a regular basis by sector
- FAO compiles data and calculates this indicator at the international level
- Data is collected through AQUASTAT country surveys since 1994 through official counterpart at country level

Kenya
Indicator 6.4.2

WATER STRESS			UNIT		CALCULATION RULES
Total freshwater withdrawn (surface + groundwater)	[1]	**4.032**	in km^3		=[2]-[3]-[4]-[5]
Total water withdrawal	[2]	4.032	in km^3	**OK**	services + agriculture + industries
Desalinated water produced	[3]	0.000	in km^3		
Direct use of treated municipal wastewater	[4]	0.000	in km^3		
Direct use of agricultural drainage water	[5]	0.000	in km^3		
Total renewable freshwater resources	[6]	**23.960**	in km^3		
Environmental flow requirements	[7]	16.8	in %	Source:	
Environmental flow requirements (volume)		**4.025**	in km^3	NWMP 2030 Sectoral Report (G). Surface Water flow value at Q95	
Water Stress	[8]	**20.2**	%		=[1]/([6]-([6]*[7]/100))

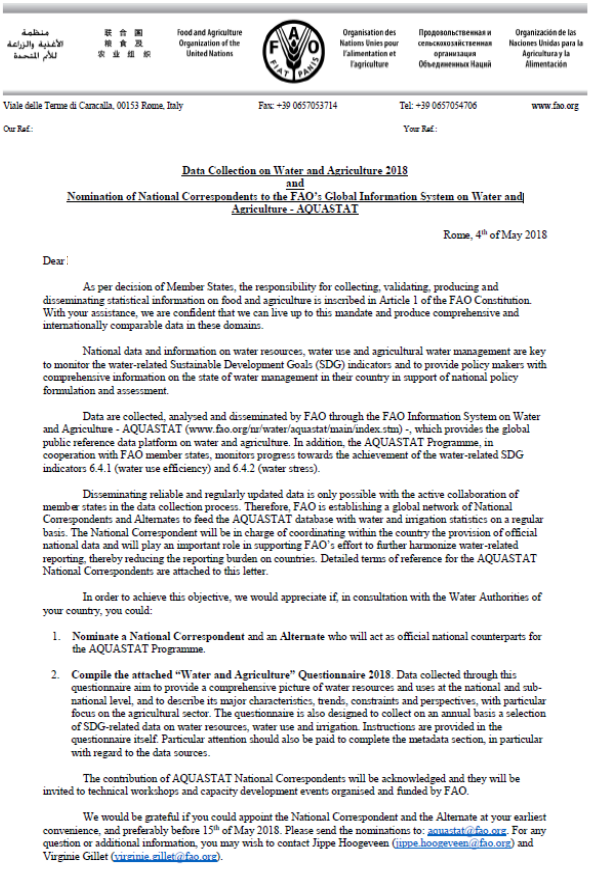
Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

6.4.2 LEVEL OF WATER STRESS (2014)



DATA COLLECTION (NEW)

- On 4 May 2018, FAO sent a letter to all countries requesting the appointment of a National Focal Point who will be responsible for completing FAO's "Water and Agriculture" Questionnaire.
- At the same time, request for:
  - Updated data on 2015-17
  - Validation of data 2000-2014
- Data collected through this questionnaire aim to provide a comprehensive picture of water resources and uses at the national and sub-national level
- These data will be critical in calculating SDG indicators 6.4.1 and 6.4.2



منظمة الأغذية والزراعة للأمم المتحدة | 联合国粮食及农业组织 | Food and Agriculture Organization of the United Nations | Organisation des Nations Unies pour l'alimentation et l'agriculture | Продовольственная и сельскохозяйственная организация Объединенных Наций | Organización de las Naciones Unidas para la Agricultura y la Alimentación

Viale delle Terme di Caracalla, 00153 Rome, Italy — Fax: +39 0657053714 — Tel: +39 0657054706 — www.fao.org

Our Ref.: — Your Ref.:

Data Collection on Water and Agriculture 2018
and
Nomination of National Correspondents to the FAO's Global Information System on Water and Agriculture - AQUASTAT

Rome, 4th of May 2018

Dear :

As per decision of Member States, the responsibility for collecting, validating, producing and disseminating statistical information on food and agriculture is inscribed in Article 1 of the FAO Constitution. With your assistance, we are confident that we can live up to this mandate and produce comprehensive and internationally comparable data in these domains.

National data and information on water resources, water use and agricultural water management are key to monitor the water-related Sustainable Development Goals (SDG) indicators and to provide policy makers with comprehensive information on the state of water management in their country in support of national policy formulation and assessment.

Data are collected, analysed and disseminated by FAO through the FAO Information System on Water and Agriculture - AQUASTAT (www.fao.org/nr/water/aquastat/main/index.stm) -, which provides the global public reference data platform on water and agriculture. In addition, the AQUASTAT Programme, in cooperation with FAO member states, monitors progress towards the achievement of the water-related SDG indicators 6.4.1 (water use efficiency) and 6.4.2 (water stress).

Disseminating reliable and regularly updated data is only possible with the active collaboration of member states in the data collection process. Therefore, FAO is establishing a global network of National Correspondents and Alternates to feed the AQUASTAT database with water and irrigation statistics on a regular basis. The National Correspondent will be in charge of coordinating within the country the provision of official national data and will play an important role in supporting FAO's effort to further harmonize water-related reporting, thereby reducing the reporting burden on countries. Detailed terms of reference for the AQUASTAT National Correspondents are attached to this letter.

In order to achieve this objective, we would appreciate if, in consultation with the Water Authorities of your country, you could:

1. **Nominate a National Correspondent** and an **Alternate** who will act as official national counterparts for the AQUASTAT Programme.
2. **Compile the attached "Water and Agriculture" Questionnaire 2018**. Data collected through this questionnaire aim to provide a comprehensive picture of water resources and uses at the national and sub-national level, and to describe its major characteristics, trends, constraints and perspectives, with particular focus on the agricultural sector. The questionnaire is also designed to collect on an annual basis a selection of SDG-related data on water resources, water use and irrigation. Instructions are provided in the questionnaire itself. Particular attention should also be paid to complete the metadata section, in particular with regard to the data sources.

The contribution of AQUASTAT National Correspondents will be acknowledged and they will be invited to technical workshops and capacity development events organised and funded by FAO.

We would be grateful if you could appoint the National Correspondent and the Alternate at your earliest convenience, and preferably before 15th of May 2018. Please send the nominations to: aquastat@fao.org. For any question or additional information, you may wish to contact Jippe Hoogeveen (jippe.hoogeveen@fao.org) and Virginie Gillet (virginie.gillet@fao.org).

We would like to receive the completed questionnaire by the 30th of May 2018 through the same email address (aquastat@fao.org). Should you have any questions, comments or difficulties in filling the questionnaire, do not hesitate to contact the AQUASTAT programme through the email addresses indicated above.

We thank you for your collaboration and look forward to hearing from you.

Yours sincerely,

Eduardo Mansur
Director, Land and Water Division
Department of Climate, Biodiversity, Land and Water

Pietro Gennari
Chief Statistician
Chief Statistician Office

Country	Nominated focal point?	Returned questionnaire?
Afghanistan	Yes	NO
Bhutan	NO	NO
India	NO	NO
Iran	NO	NO
Japan	NO	NO
Lao PDR	Yes	Yes
Malaysia	Yes	Yes
Maldives	Yes	NO
Mongolia	Yes	NO
Pakistan	Yes	Yes
Papua New Guinea	NO	NO
Republic of Korea	NO	NO
Samoa	NO	NO
Thailand	Yes	Yes
Turkmenistan	NO	NO
Uzbekistan	Yes	Yes

Country	National Focal point for 6.4.1/6.4.2
Afghanistan	▪ Mr Esmatullah Hakimi, Head of Economic Statistic Department, Central Statistics Organization of Afghanistan ▪ Mr Mohammad Qasim Kabari
Bhutan	
India	
Iran	
Japan	
Lao PDR	▪ Mr Saengdavanh INTHAVONG ▪ Mr Phayseng PHOMPHAKDY
Malaysia	▪ Ms Zaitun Mohd Taha, StatsMalaysia ▪ Mr Ismail Abdul Rahman
Maldives	▪ Mr Mohamed Musthafa, Director General, Ministry of Environment and Energy ▪ Mr Afsal Hussain, Director, Ministry of Environment and Energy

Country	National Focal point for 6.4.1/6.4.2
Mongolia	Oyunjargal MANGALSUREN, Senior Statistician of Economic Statistics Department, National Statistics Office of Mongolia
Pakistan	▪ Mr.Fazil Mahmood Baig, Director (National Account), Pakistan Bureau of Statistics ▪ Mr Waqar Aslam, Chief Statistical Officer (agriculture), PBS
Papua New Guinea	
Republic of Korea	
Samoa	
Thailand	▪ Chalermkiat Khongwichianwat, Deputy Director General for Engineering, Royal Irrigation Department ▪ Mr. Sanya Saengpumpong, Director of Water Management and Hydrology Bureau, Royal Irrigation Department
Turkmenistan	
Uzbekistan	▪ Mr. Z.Ishpulatov, Head of Sector, Ministry of Water Resources of the Republic of Uzbekistan ▪ Ms N.Dekhkanova, Leading specialist, The state Committee of the republic of Uzbekistan of Statistics

Country	Latest Date	SDG indicator 6.4.2 – level of water stress-2014 (%)
Afghanistan	**2000**	**43.67**
Bhutan	**2008**	**0.56**
India	**2010**	**44.53**
Iran	**2004**	**89.99**
Japan	**2009**	**28.45**
Lao PDR	**2005**	**1.39**
Malaysia	**2005**	**3.41**
Maldives	**2008**	**15.66**
Mongolia	**2009**	**2.42**
Pakistan	**2008**	**102.50**
Papua New Guinea	**2005**	**0.09**
Republic of Korea	**2005**	**57.58**
Samoa	**N/A**	**N/A**
Thailand	**2007**	**17.48**
Turkmenistan	**2004**	**162.83**
Uzbekistan	**2005**	**138.82**

AQUASTAT

- The world's most comprehensive database on water
- Compiled water use data needed for SDG indicators 6.4.1 and 6.4.2, but many other data as well
- Country profiles available including multiple water use variables
- http://www.fao.org/nr/water/aquastat/main/index.stm

HOW IS FAO SUPPORTING COUNTRIES

- An e-learning course on 6.4.2 is already available, whereas an e-learning course on 6.4.1 is currently being finalized
- In 2017, FAO organized three workshops in Rome, Guatemala and Casablanca on SDG indicators 6.4.1 and 6.4.2.
- In 2018, FAO organized or supported workshops in China, Mexico, Uruguay, Cote d'Ivoire, Ecuador and Azerbaijan
- Further direct technical assistance can be provided upon request.

THANK YOU

DorianKalamvrezos.Navarro@fao.org

For more detailed information please see:

- http://www.fao.org/sustainable-development-goals/indicators/641/en/
- http://www.fao.org/sustainable-development-goals/indicators/642/en/