Integrated Monitoring Initiative for SDG 6

Indicators 6.4.1 & 6.4.2
Change in water use efficiency over time
Level of water stress

ESCWA

Virtual Training on SDG Indicators

28 April 2021

Ghaieth Ben Hamouda – Land and Water Division - FAO

Food and Agriculture Organization
of the United Nations

Data colour coding

Water resources

Water usage

Other parameters

Indicator 6.4.1 – Change in water-use efficiency over time

1. Goals and Targets addressed

- Goal 6: Ensure availability and sustainable management of water and sanitation for all

- Target 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

1. Goals and Targets addressed

- Goal 6: Ensure availability and sustainable management of water and sanitation for all

- Target 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

2. Definition and method of computation

- The change in the ratio of the value added to the volume of water use, over time.
- Water Use Efficiency (WUE) is defined as the value added of a given major sector divided by the volume of water used by that sector.
- Following ISIC 4 coding, sectors are defined as:
  - agriculture; forestry; fishing (ISIC A), hereinafter “**agriculture**”;
  - mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; constructions (ISIC B, C, D and F), hereinafter “**MIMEC**”;
  - all the service sectors (ISIC E and ISIC G-T), hereinafter “**services**”.

2. Definition and method of computation

- Water use: water that is received by an industry or households from another industry or is directly abstracted
- Water abstraction: water removed from the environment by the economy
- Cultivated land (cropland) is the land under temporary agricultural crops (multiple-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens and land temporarily fallow (less than five years), plus the land cultivated with long-term crops which do not have to be replanted for several years; land under trees and shrubs producing flowers; and nurseries.
  Permanent meadows and pastures are excluded from land under permanent crops.

Food and Agriculture Organization of the United Nations

2. Definition and method of computation

- *Computation*
- The indicator is computed as the sum of the three economy sectors, weighted according to the proportion of water use by each sector over the total use. In formula:

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

2. Definition and 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

Food and Agriculture Organization of the United Nations

2. Definition and method of computation

$$WUE_{sec} = \frac{GVA_{sec}}{V_{sec}}$$

- Where:
- WUE_{sec} = Water use efficiency for a given sector of the economy
- GVA_{sec} = Gross value added by a given sector of the economy [USD]
- V_{sec} = Volume of water used by a given sector of the economy [m^3]

2. Definition and method of computation

- *Water use efficiency in irrigated agriculture* is calculated as the agricultural value added per agricultural water use, expressed in USD/m³.
- In formula:
- $$A_{we} = \frac{GVA_a \times (1 - C_r)}{V_a}$$
- Where:
- A_{we} = *Irrigated agriculture water use efficiency [USD/m³]*
- GVA_a = Gross value added by agriculture (excluding river and marine fisheries and forestry) [USD]
- C_r = Proportion of agricultural GVA produced by rainfed agriculture
- V_a = Volume of water used by the agricultural sector (including irrigation, livestock and aquaculture) [m³]

2. Definition and method of computation

- *Water use efficiency in irrigated agriculture* is calculated as the agricultural value added per agricultural water use, expressed in USD/m³.
- In formula:
- $$A_{we} = \frac{GVA_a \times (1 - C_r)}{V_a}$$
- Where:
- A_{we} = *Irrigated agriculture water use efficiency [USD/m³]*
- GVA_a = Gross value added by agriculture (excluding river and marine fisheries and forestry) [USD]
- C_r = Proportion of agricultural GVA produced by rainfed agriculture
- V_a = Volume of water used by the agricultural sector (including irrigation, livestock and aquaculture) [m³]

3. Rationale and interpretation

- The rationale behind this indicator consists in providing information on the efficiency of the economic and social usage of water resources

- This indicator needs to be combined with the water stress indicator 6.4.2 to provide adequate follow-up of the target formulation

- The interpretation of the indicator would be enhanced by the utilization of supplementary indicators to be used at country level. Particularly important in this sense would be the indicator on efficiency of water for energy and the indicator on the efficiency of the municipality distribution networks

Food and Agriculture Organization of the United Nations

3. Rationale and interpretation

- Water use efficiency is strongly influenced by the economic structure and the proportion of water intensive sectors

- The change in water use efficiency is influenced by both ‘real’ improvements and deteriorations, as well as by changes in economic and social structure.

- Key message: Increasing values in time series indicate decoupling of the economic growth from water use. It does not necessarily indicate decline in total water use or a reduction of the impact of water use (see water stress – 6.4.2)

Food and Agriculture Organization of the United Nations

4. Disaggregation

- The indicator covers agricultural, mining and manufacturing and energy sectors, and also captures water supply efficiency of the water distribution network, so to provide the means for a more detailed analysis of the water use efficiency for national planning and decision-making.
- Disaggregation by sub-sector in agriculture may be needed to cover adequately water use for livestock and aquaculture:

$$A_{we} = \frac{GVA_{al} + GVA_{aa} + [GVA_{ai} \times (1 - C_r)]}{V_a}$$

Food and Agriculture Organization of the United Nations

Change in water use efficiency

- Change in water use efficiency (CWUE) is computed as the ratio of water use efficiency (WUE) in time t minus water use efficiency in time t-1, divided by water use efficiency in time t-1 and multiplied by 100:

$$CWUE = \frac{WUE_t - WUE_{t-1}}{WUE_{t-1}} * 100$$

Change in water use efficiency

On the other side, in order to calculate the trend over a longer time period the following formula can be used:

$$TWUE = \frac{WUE_t - WUE_{t_0}}{WUE_{t_0}} * 100$$

Where t_0 is the value of WUE at time zero (the base year)

Food and Agriculture Organization of the United Nations

Indicator 6.4.2 – Level of water stress: freshwater withdrawal in percentage of available freshwater resources

Food and Agriculture Organization of the United Nations

1. Goals and Targets addressed

- Goal 6: Ensure availability and sustainable management of water and sanitation for all

- Target 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

2. Definition and method of computation

- The ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after having taken into account environmental water requirements.

2. Definition and method of computation

- **Method of computation:** The indicator is computed as the total freshwater withdrawn (TFWW) divided by the difference between the total renewable freshwater resources (TRWR) and the environmental flow requirements (EFR), multiplied by 100. **All variables are expressed in km^3/year (10^9 m^3/year).**
-
- $$Water\ Stress\ (\%) = \frac{TFWW}{TRWR - EFR} * 100$$

2. Definition and method of computation

- **Method of computation:** The indicator is computed as the total freshwater withdrawn (TFWW) divided by the difference between the total renewable freshwater resources (TRWR) and the environmental flow requirements (EFR), multiplied by 100. **All variables are expressed in km³/year (10^9 m³/year).**
-
- $Water\ Stress\ (\%) = \frac{TFWW}{TRWR - EFR} * 100$

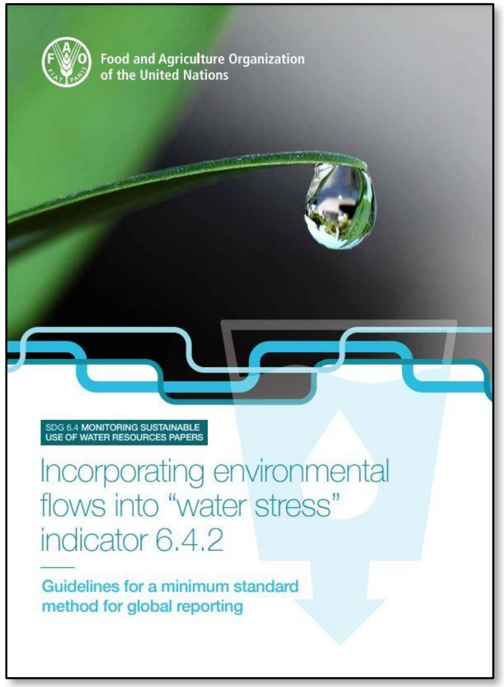
3. Rationale and interpretation

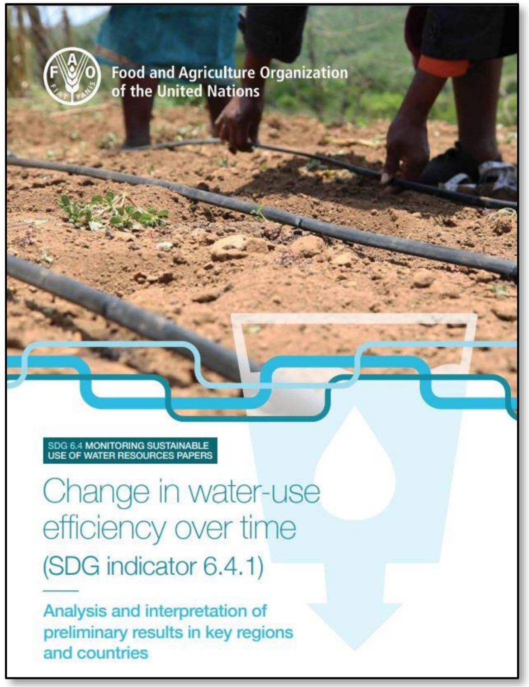
- **Concepts:** This indicator provides an estimate of pressure by all sectors on the country's renewable freshwater resources.
- A low level of water stress indicates a situation where the combined withdrawal by all sectors is marginal in relation to the resources, and has therefore little potential impact on the sustainability of the resources or on the potential competition between users.
- 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.

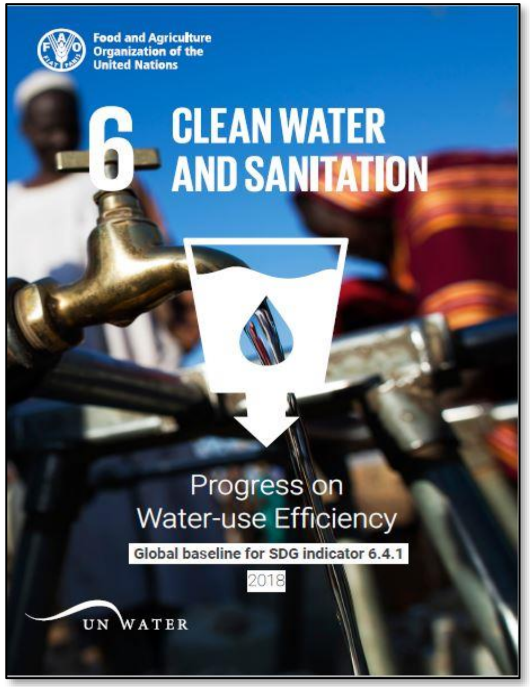
4. Disaggregation

- The indicator can be disaggregated to show the respective contribution of different sectors to the country's water stress, and therefore the relative importance of actions needed to contain water demand in the different sectors (agriculture, industry and services).
- At national level, water resources and withdrawal are estimated or measured at the level of appropriate hydrological units (river basins, aquifers). It is therefore possible to obtain a geographical distribution of water stress by hydrological unit, thus allowing for more targeted response in terms of water demand management.

Useful resources







Food and Agriculture Organization of the United Nations

Thank You

To contact IMI-SDG6: Ghaieth Ben Hamouda: Ghaieth.benhamouda@fao.org

Riccardo Biancalani: Riccardo.Biancalani@fao.org

Lucie Chocholata: Lucie.Chocholata@fao.org