

Methodologies, data sources and challenges related to indicators on wastewater treatment (6.3.1), water use efficiency (6.4.1) and water stress (6.4.2)

Tier I and tier II indicators

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Tier of water-related indicators

Internationally established methodologies available

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- **Indicators discussed in this presentation:**
 - 6.3.1: Proportion of wastewater safely treated (tier II)
 - 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)

Proportion of wastewater safely treated

SDG Indicator 6.3.1

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6.3.1: Proportion of wastewater safely treated

Policy context

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- **SDG Target 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

Custodian agencies:

- World Health Organization (WHO)
- United Nations Human Settlements Programme (UN-HABITAT)

6.3.1: Proportion of wastewater safely treated

Indicator definition

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Definition:

Proportion of wastewater generated by households and by economic activities which is safely treated compared to total wastewater generated by households and economic activities.

What means safely treated?

- International norms and standards exist, but countries can set their own standards
- Examples for safely treated wastewater:
 - Treatment performance meets national targets
 - Secondary treatment or higher, or primary treatment with a long ocean outfall

Disaggregation: households/non- households and by ISIC

6.3.1: Proportion of wastewater safely treated

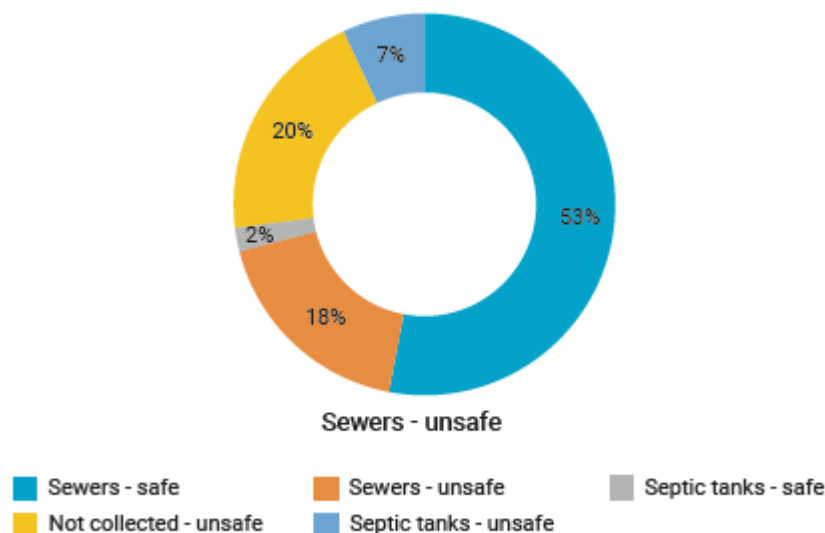
Rationale

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Only 59 % of domestic wastewater flow is collected and safely treated. The untreated 41 % poses risks to the environment and public health (WHO and UN-Habitat, 2018).

Domestic waste water treatment by type in 2010



Source: UN Water, World Health Organization (WHO) and UN-Habitat 2010 Tier II; Custodian agency: World Health Organization (WHO) and UN-Habitat

6.3.1: Proportion of wastewater safely treated

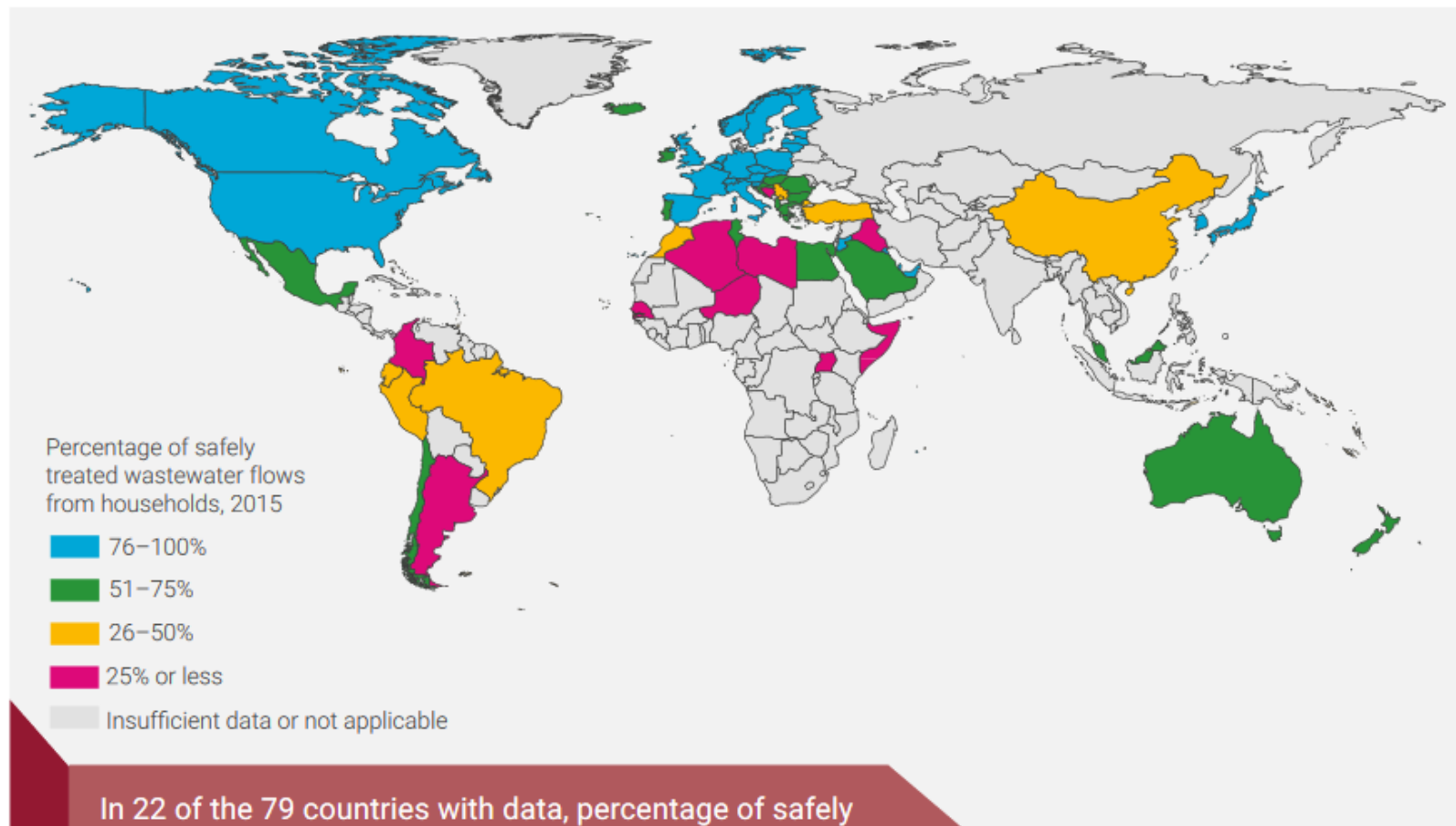
Data availability on domestic wastewater treatment

(https://www.who.int/water_sanitation_health/publications/progress-of-wastewater-treatment/en/)



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Map 1: Preliminary estimate for domestic wastewater treatment (6.3.1a)



Source: United Nations, 2018

6.3.1: Proportion of wastewater safely treated

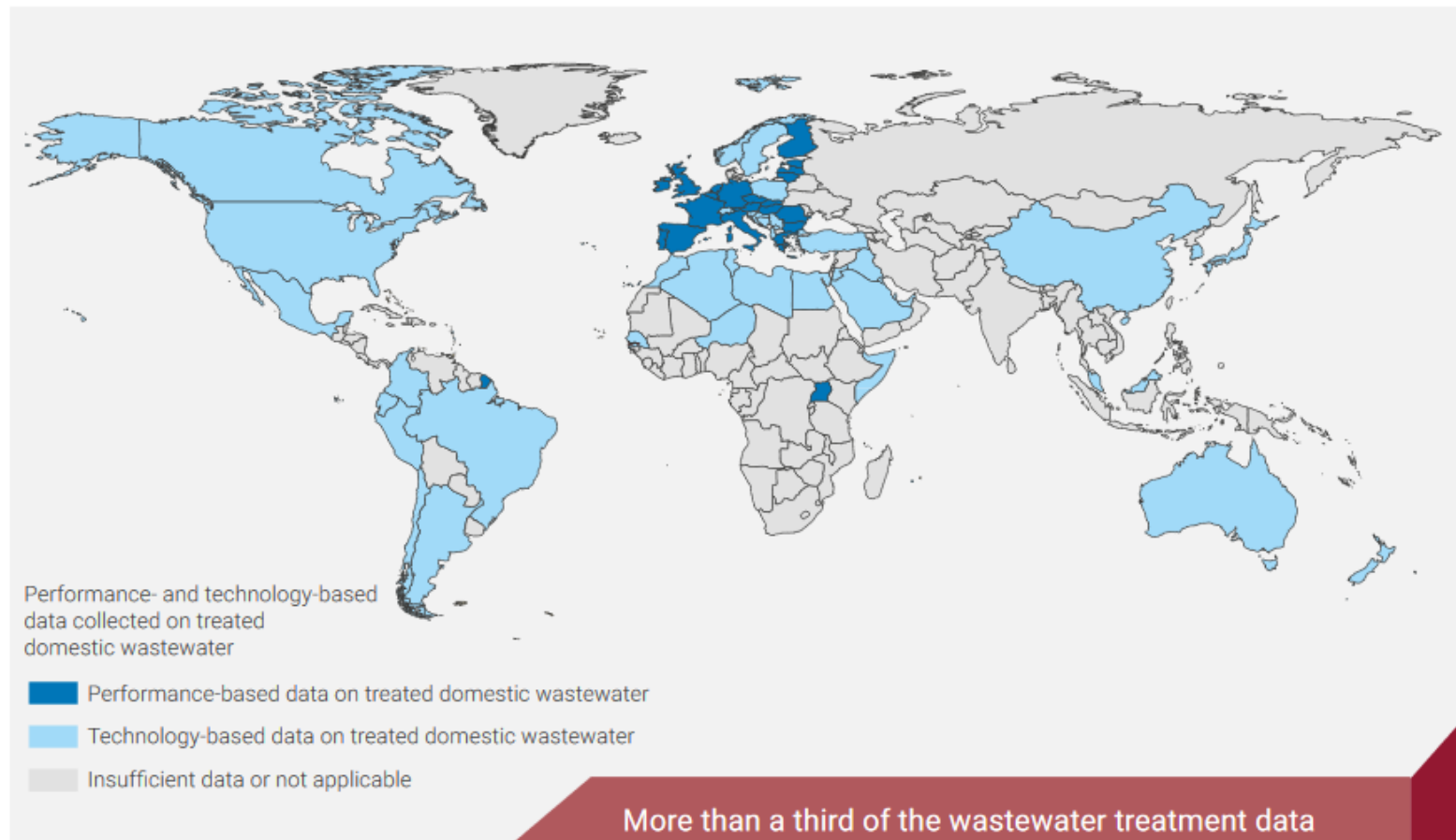
Data availability on domestic wastewater treatment

(https://www.who.int/water_sanitation_health/publications/progress-of-wastewater-treatment/en/)



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Map 2: Countries for which preliminary estimates for 6.3.1a are derived from performance data



Source: United Nations, 2018

More than a third of the wastewater treatment data collected is performance-based

6.3.1: Proportion of wastewater safely treated

Safely treated industrial wastewater flows

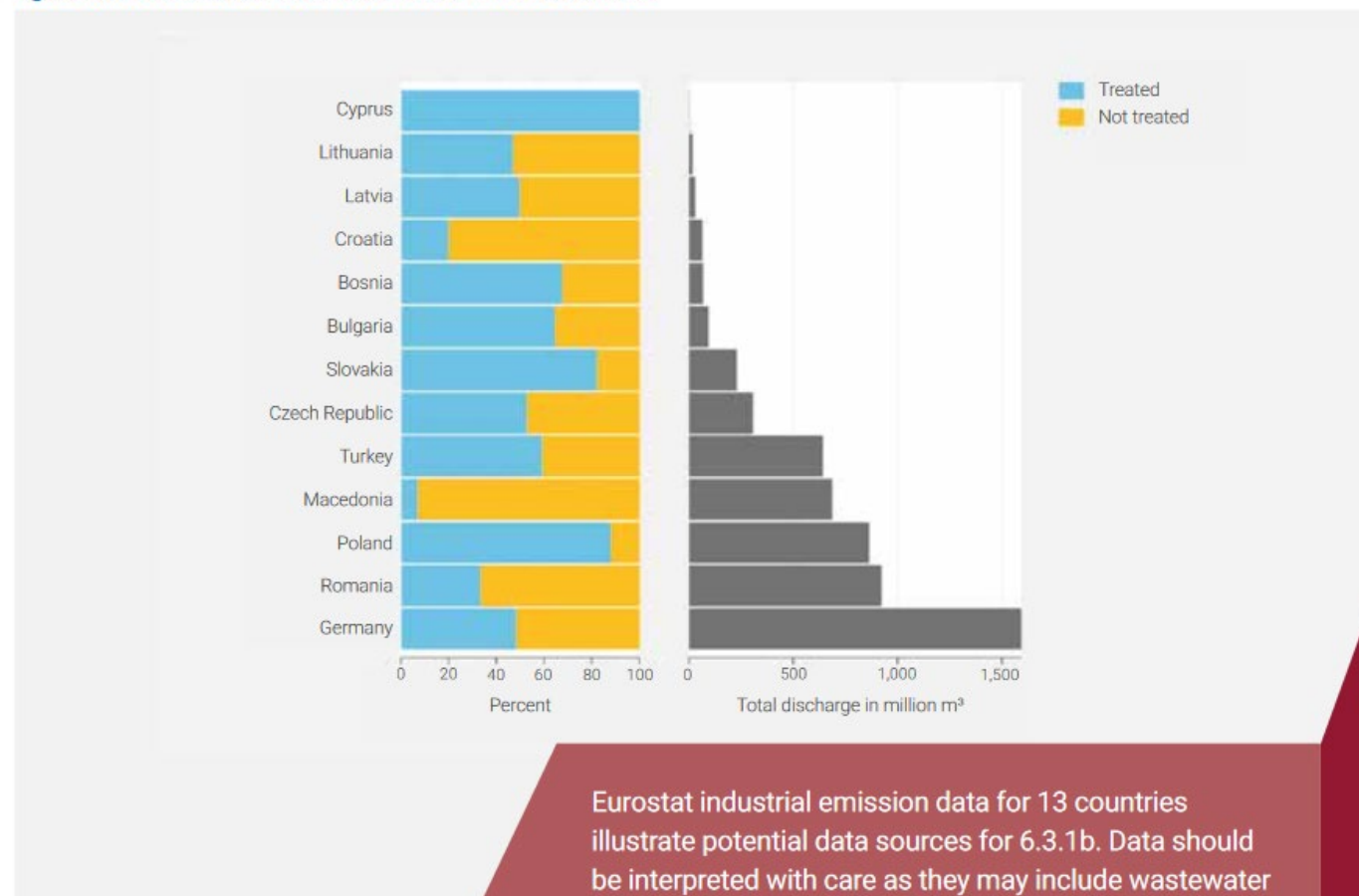
(https://www.who.int/water_sanitation_health/publications/progress-of-wastewater-treatment/en/)



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Estimating industrial wastewater treatment is more challenging than estimating domestic wastewater treatment. Global data on industrial discharges are poorly monitored and seldom aggregated at the national level

Figure 4: Industrial wastewater treatment data for 13 countries



Source: Eurostat

Eurostat industrial emission data for 13 countries illustrate potential data sources for 6.3.1b. Data should be interpreted with care as they may include wastewater that does not need to be treated before being discharged (i.e. cooling water) as “untreated”, and this may constitute a significant proportion.

6.3.1: Proportion of wastewater safely treated

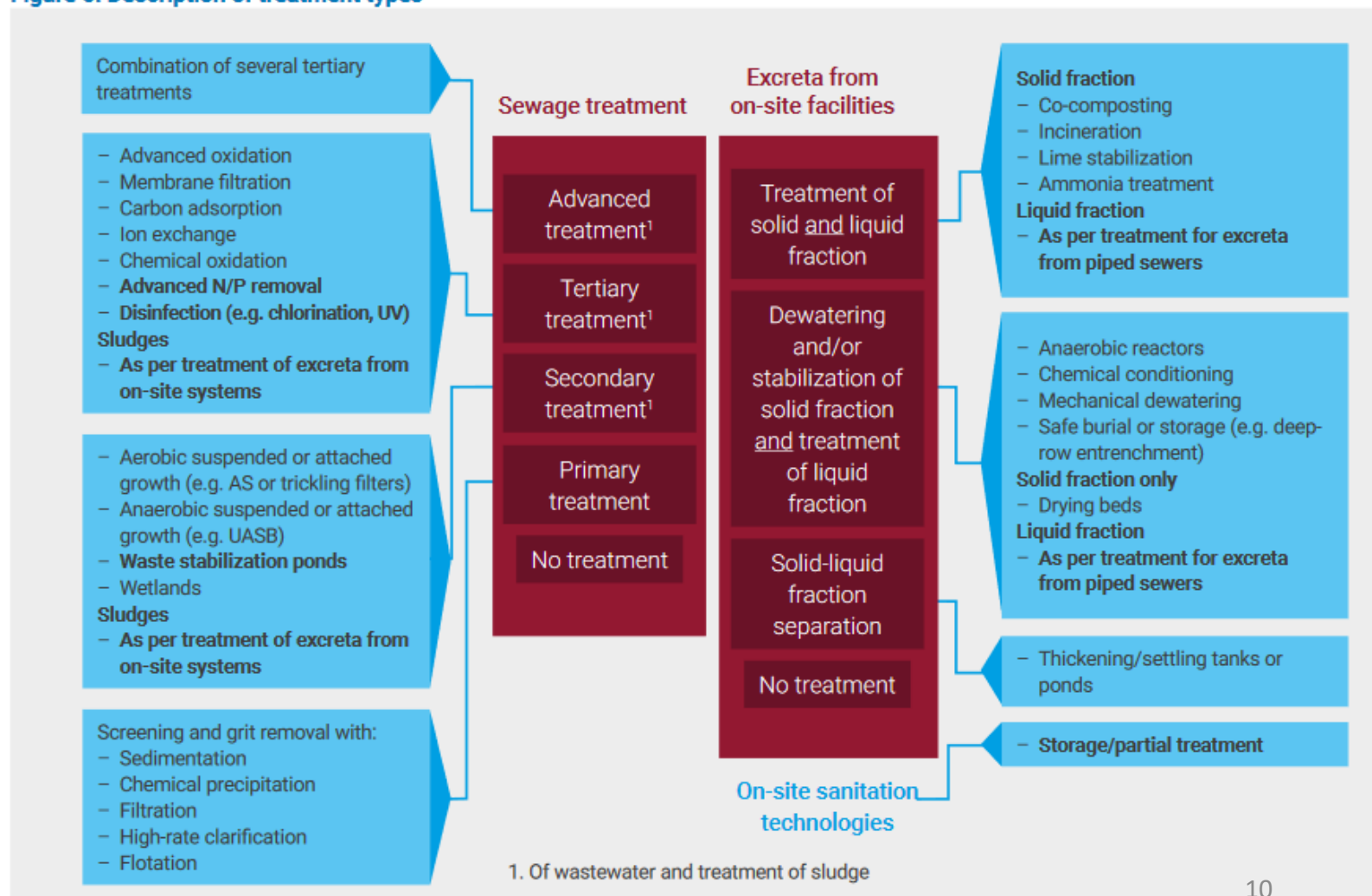
Treatment types (technology based)

(https://www.who.int/water_sanitation_health/publications/progress-of-wastewater-treatment/en/)



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Figure 6: Description of treatment types



6.3.1: Proportion of wastewater safely treated

Treatment types (performance based)
(Joint OECD/UNECE Questionnaire on Inland Waters)

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TREATMENT PLANTS CLASSIFICATION

Category	Treatment efficiencies					Count Faecal Coliforms
	TSS	BOD	COD/TOC	N	P	
Primary treatment	>50%	>20%				
Secondary treatment		>70%	>75%			
Tertiary treatment: Of which for Organic Pollution Of which for Nitrogen Of which for Phosphorous Of which for Microbiological pollution		>95%	>85%	>70%	>80%	<1000 / 100 ml

Primary treatment: Septic tank

At least secondary treatment (*):

Systems using filtration :

Filtration bed

Biological sandfilter

Infiltration field (vertical flow)

Rootzone system (horizontal flow)

Mini biological treatment plants:

Biorotor

Submerged bed

Trickling filter

Activated sludge system

Anaerobic treatment systems

Examples of independent treatment methods (1-50 p.e.):

Remarks:

(*) In many cases the listed treatment methods require pre-settling in a septic tank.

6.3.1: Proportion of wastewater safely treated

Data sources

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Water statistics, such as used for:

- UNSD/UNEP questionnaire on Environment Statistics:
- OECD/Eurostat Joint Questionnaire on Inland Waters
- Shared Environmental Information System (SEIS) and UNECE Guidelines for the Application of Environmental Indicators

6.3.1: Proportion of wastewater safely treated

Calculation of the indicator

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$$= \frac{\text{domestic wastewater treated} + \text{industrial wastewater treated}}{\text{wastewater generated}}$$

Remarks:

- Wastewater treated Includes on-site and off-site treatment
- SDG metadata use the term “domestic wastewater”, international questionnaires use the term “urban wastewater”

Step by step calculation guide:

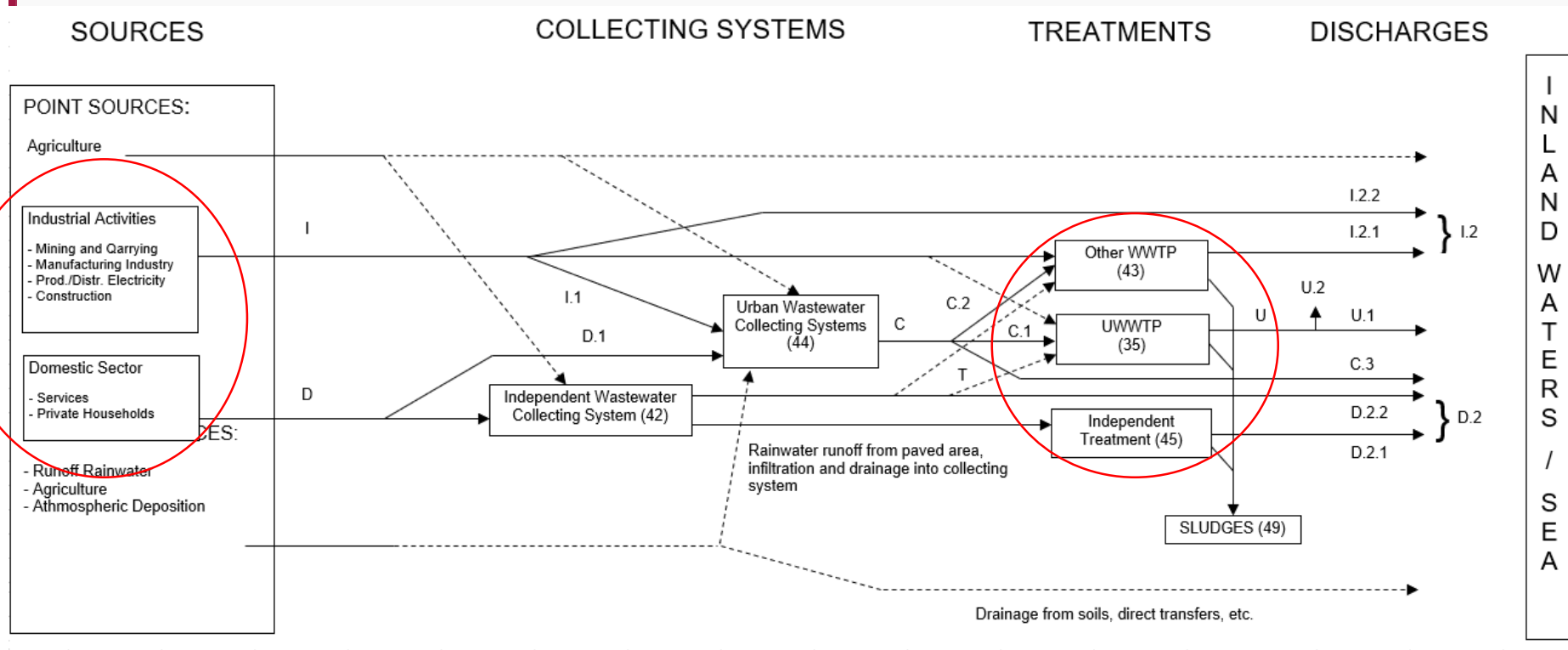
<http://www.unwater.org/publications/step-step-methodology-monitoring-wastewater-treatment-6-3-1/>

6.3.1: Proportion of wastewater safely treated

Wastewater data in the Eurostat/OECD Joint Questionnaire on Inland waters



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Change in water use efficiency over time

SDG Indicator 6.4.1

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6.4.1: Change in water-use efficiency over time

Policy context

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- **SDG 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

Custodian agency:

- Food and Agriculture Organization of the United Nations (FAO)

6.4.1: Change in water-use efficiency over time

Rationale

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- Providing information on the **efficiency of the economic and social usage of water resources**.
- Addresses specifically the target component “**substantially increase water-use efficiency across all sectors**”, by measuring the output per unit of water from productive uses of water as well as losses in municipal water use.
- Provides a measure of **overall water efficiency**.
- Provides **incentives to improve water use efficiency** through all sectors, highlighting those sectors where water use efficiency is lagging behind.

6.4.1: Change in water-use efficiency over time

Rationale

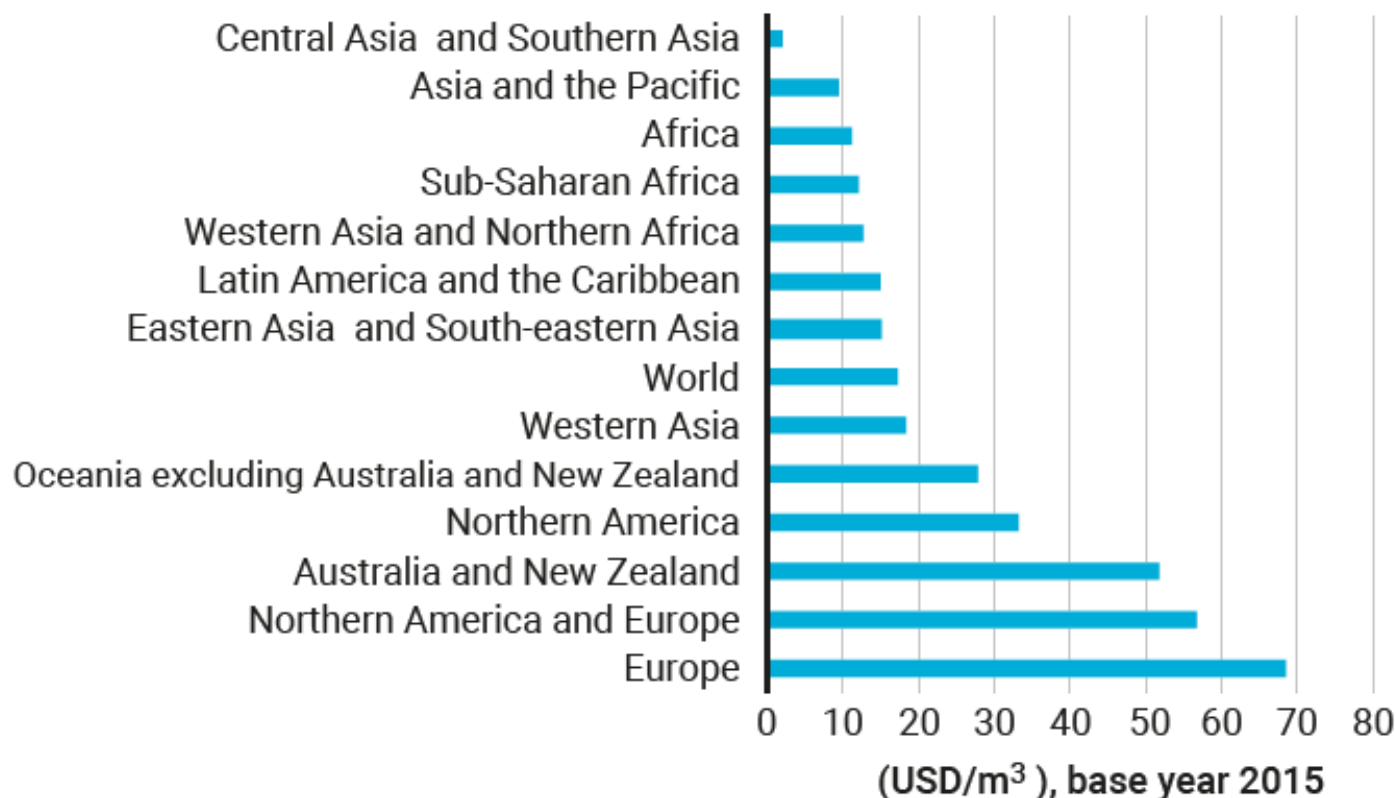
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Agricultural sector is responsible for ca. 69% of all water used globally. (Wallace, 2000)

Proportion of total water withdrawn for agriculture (%)

Water use efficiency by region ((USD/m²), base year 2015)



6.4.1: Change in water-use efficiency over time

Calculation of the indicator

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Calculation of the indicator

- Measures the relative change of Water Use Efficiency (WUE)
- WUE is defined as the value added of a given major sector divided by the volume of water used:
 - Agriculture; forestry; fishing (ISIC A)
 - Mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; constructions (ISIC B, C, D and F) – “MIMEC”
 - All the service sectors (ISIC E and ISIC G-T)
- WUE is computed as the sum of the three sectors, weighted according to the proportion of water used by each sector over the total use.

Step by step methodology (UN WATER): see

<http://www.unwater.org/publications/step-step-methodology-monitoring-water-use-efficiency-6-4-1/>

6.4.1: Change in water-use efficiency over time

Water use efficiency in irrigated agriculture



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$$A_{we} = \frac{GVA_a \times (1 - C_r)}{V_a}$$

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]

C_r can be calculated from the proportion of irrigated land on the total Arable land and Permanent crops (hereinafter “cultivated land”, as follows:

$$C_r = \frac{1}{1 + \frac{A_i}{(1 - A_i) * 0.375}}$$

Where:

A_i = proportion of irrigated land on the total cultivated land, in decimals

0.375 = generic default ratio between rainfed and irrigated yields

6.4.1: Change in water-use efficiency over time

Water use efficiency of the MIMEC sectors



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In formula:

$$M_{we} = \frac{GVA_m}{V_m}$$

Where:

M_{we} = Industrial water use efficiency [USD/m³]

GVA_m = Gross value added by MIMEC (including energy) [USD]

V_m = Volume of water used by MIMEC (including energy) [m³]

Remarks:

- Does not include water used for hydropower generation
- Includes losses for evaporation from artificial lakes used for hydropower production

6.4.1: Change in water-use efficiency over time

Water use efficiency of the service sectors

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In formula:

$$S_{we} = \frac{GVA_s}{V_s}$$

Where:

S_{we} = *Services water use efficiency [USD/m³]*

GVA_s = Gross value added by services [USD]

V_s = Volume of water used by the service sector [m³]

6.4.1: Change in water-use efficiency over time

Data needs and open questions



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Data needs

- Annual quantity of water use for the 3 sectors
- Value added for each of the sectors.
- For the calculation of the GVA produced by irrigated agriculture additional statistics on the irrigated land, total arable land and permanent crops

Data sources:

- Eurostat/OECD Joint Questionnaire on Inland Waters
- Water accounts
- AQUASTAT

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

SDG Indicator 6.4.2

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

Policy context



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- **SDG 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

Custodian agency:

- Food and Agriculture Organization of the United Nations (FAO)

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

Indicator definition



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

Main sectors, as defined by ISIC standards, include agriculture; forestry and fishing; manufacturing; electricity industry; and services.

This indicator is also known as water withdrawal intensity.

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

Rationale



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- Shows the degree to which water resources are being exploited to meet the country's water demand
- Indicates the likelihood of increasing competition and conflict between different water uses and users in a situation of increasing water scarcity
- Increased water stress, shown by an increase in the value of the indicator, has potentially negative effects on the sustainability of the natural resources and on economic development.

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

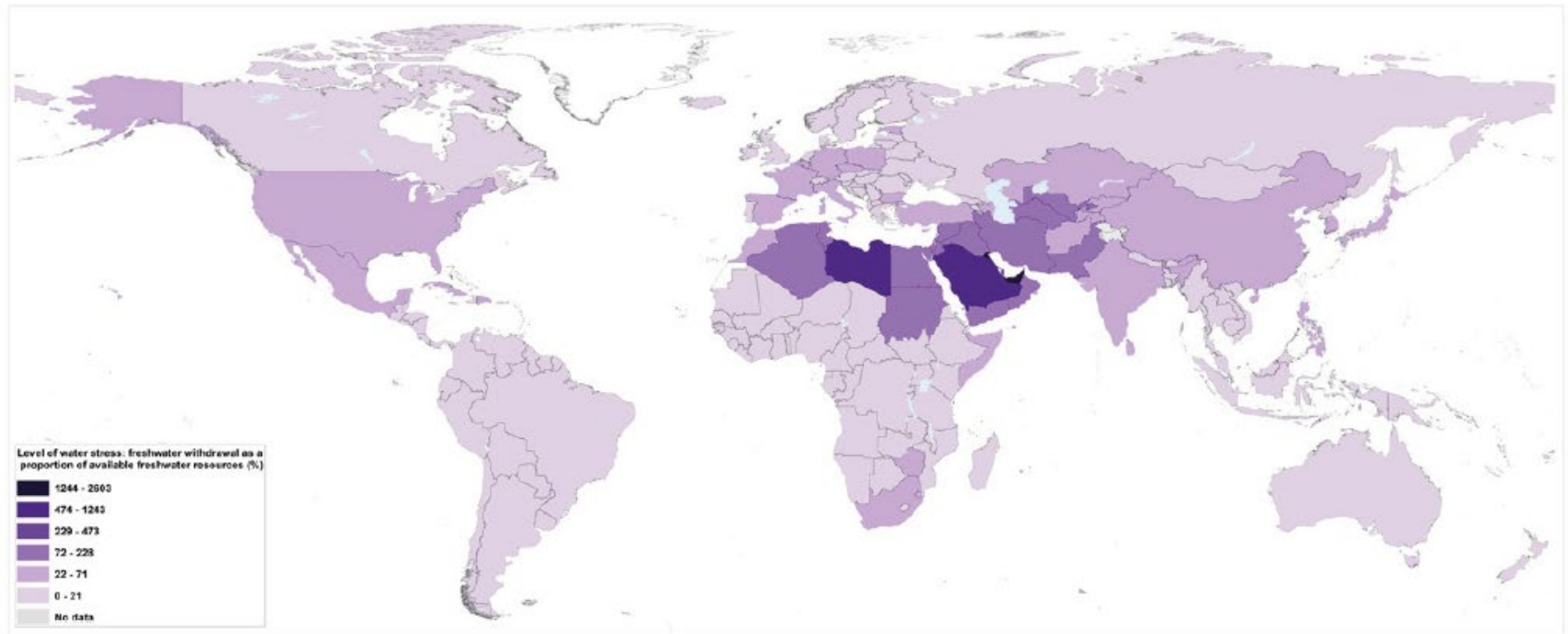
Rationale



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

The world's average water stress level stands at almost 13 percent with more than 2 billion people living in countries experiencing high levels of water stress.



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

Calculation of the indicator



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Calculation of the indicator

- Ratio between total freshwater withdrawn (TWW) by all major sectors and total renewable freshwater resources (TRWR), after taking into account environmental water requirements (Env.):
 - $$\text{Stress (\%)} = \text{TWW} / (\text{TRWR} - \text{Env.}) * 100$$

Disaggregation:

- By sector
- By hydrological unit

Step by step methodology (UN WATER): see www.unwater.org/app/uploads/2017/05/Step-by-step-methodology-6-4-2_Revision-2017-01-19_Final-1.pdf

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

Data needs and open questions



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Data needs

- Total freshwater withdrawn (abstracted) per year
- Total renewable freshwater resources: long-term annual average (LTAA): Sum of internal and external renewable water resources: Precipitation – actual evapotranspiration + external inflow
- Environmental water requirements

Remarks

- Industrial water withdrawal does not include hydropower, but it is recommended to include in this sector the losses for evaporation from artificial lakes used for hydropower production
- Cooling water is included in the total freshwater abstracted
- Environmental water requirements: FAO launched “Guidelines for a minimum methodological standard for global reporting” on how to incorporate environmental flows into “water stress” indicator 6.4.2. in January 2019 (see webcast <http://www.unwater.org/environmental-flows-in-the-indicator-6-4-2/>)

Thank you very much for your attention!

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