

Circular Economy Indicators related to water

SDG and Environment Statistics Unit, 2025 Early Warning and Assessment Division, UNEP



Indicator 10: Level of water stress: freshwater withdrawal as a proportion of available freshwater resources.

This indicator of circular economy corresponds to the SDG 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources.

The methodology for this indicator is based on UNSD's Metadata for 6.4.2 and UN-Water's Step-by-step methodology for monitoring water stress (6.4.2) (2016).

SDG target 6.4 aims to substantially increase, by 2030, 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.

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Level of water stress

LEVEL I INDICATOR

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

Estimations based on national data aggregated to the country level.

LEVEL II INDICATOR

Level of water stress: freshwater withdrawal as a proportion of Nationally produced data. available freshwater resources

LEVEL III INDICATOR

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

The nationally produced data have high spatial and temporal resolution and can be fully disaggregated by source and use.



Level of water stress Indicator interpretation (I)

The purpose of this indicator is to show the degree to which water resources are being exploited to meet the country's water demand.

It measures a country's exerted pressure on its water resources and therefore the challenge on the sustainability of its water use.

It tracks progress regarding withdrawals and supply of freshwater to address water scarcity.

The indicator shows to what extent water resources are already used, and signals the importance of effective supply and demand management policies.

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Level of water stress Indicator interpretation (II)

This indicator also provides an estimate of pressure by all sectors on the country's renewable freshwater resources.

It indicates the likelihood of increasing competition and conflict between different water uses and users in a situation of increasing water scarcity.



Level of water stress Indicator interpretation (III)

Increased water stress has potentially negative effects on the sustainability of the natural resources and on economic development.

Low values of the indicators indicate that water does not represent a particular challenge for economic development and sustainability.

Extremely low values may indicate the inability of a country to use properly its water resources for the benefit of the population.

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Level of water stress

Indicator interpretation (IV)

Above 25% of water stress, four classes have been identified to signal different levels of stress severity:

NO STRESS <25% LOW 25% - 50% MEDIUM 50% - 75% HIGH 75-100% CRITICAL >100%



Data availability (I)

All the data needed for the compilation of the indicator can be found in the AQUASTAT database of FAO. Using AQUASTAT data would be probably the simplest way to compile the indicator in the short term.

It is important to note that AQUASTAT data is based on national data, and extrapolated or forecasted for additional years in case countries do not report their national data.

FAO is the custodian agency for this SDG indicator, data collection is done through the AQUASTAT questionnaire on water and agriculture and FAO's Global Information System on Water and Agriculture (AQUASTAT).

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Level of water stress Data availability (II)

Data for this indicator are usually collected by national ministries and institutions having water-related issues in their mandate.

Examples: National statistic offices, ministries of water resources, agriculture or environment.

Data are mainly published within national statistical yearbooks, national water resources and irrigation master plans and other reports (such as those from projects, international surveys or results and publications from national and international research centres).

AQUASTAT is available at https://data.apps.fao.org/aquastat/?lang=en

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Limitations in the use of the indicator (I)

Water stress only partially addresses the issues related to sustainable water management.

Supplementary indicators are required (water demand management, behavioural changes regarding water use, the availability of appropriate infrastructure...).

This indicator does not recognize the different climatic environments that affect water use in countries, especially in agriculture, which is the main user of water.

Trends in freshwater withdrawal show relatively slow patterns of change. Usually, 3-5 years are a minimum frequency to be able to detect significant changes.

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Level of water stress

Limitations in the use of the indicator (II)

Estimation of water withdrawal by sector may represent a limitation to the computation of the indicator.

Other limitations that affect the interpretation of the water stress indicator include:

- Computation of incoming freshwater flows originating outside of a county's borders:
- Large variation of sub-national data;
- Lack of historical account
- Lack of consideration of water quality and its suitability for use...



Level I Indicator

The indicator can be populated with estimations based on national data aggregated to the country level.

If needed, data can be retrieved from internationally available databases on water availability and withdrawals by different sectors. I

nclusion of estimation of environmental flows requirements based on literature values.

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Level of water stress

Level II Indicator

The indicator can be populated with nationally produced data, which increasingly can be disaggregated to the sub-national basin unit level.

Inclusion of estimation of environmental flows requirements based on literature values.

As data from different sectors and sources are needed at level II and III, it is necessary that a national coordination is in place to assure the timely (annually) and consistent collection of the data.

The disaggregation of the information at sub-national level should be done by basin units.



Level III Indicator

The nationally produced data have high spatial and temporal resolution and can be fully disaggregated by source (surface water/groundwater) and use (economic activity):

- Agriculture; forestry; fishing (ISIC A)
- Mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; constructions (ISIC B, C, D and F)
- All the service sectors (ISIC E and ISIC G-T)

Information at sub-national level is especially important for larger countries or countries with marked climatic differences within their territory. The most advisable units to be used are river basins. A map of the country showing the administrative boundaries (provinces or districts) and basin boundaries should be prepared.

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Level of water stress Compilation of the indicator

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 (10⁹ m³/year).

Stress (%) =
$$\frac{TFWW}{(TRWR - EFR)} \times 100$$



Level of water stress Compilation of the indicator (I)

Total freshwater withdrawal (TFWW)

TFWW is [the sum of total water withdrawal by sector] minus [direct use of wastewater, direct use of agricultural drainage water and use of desalinated water].

$$TFWW = \sum ww_s - \sum du_u$$

TFWW: Total freshwater withdrawal

ww_s: Water withdrawal for sector "s".

s: Agriculture, industry, energy, etc. du,,: Direct water use from source "u".

u: Direct use of wastewater, direct use of agricultural drainage water and use of desalinated water.

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Level of water stress Compilation of the indicator (II)

Agricultural water withdrawal (km³/yr)

Annual quantity of self-supplied water withdrawn for irrigation, livestock and aquaculture purposes.

Water withdrawal for irrigation (km³/year)

Water withdrawal for livestock (watering and cleaning) (km³/year)

Water withdrawal for aquaculture (km³/year)



Level of water stress Compilation of the indicator (III)

Industrial water withdrawal (km³/yr)

This sector refers to self-supplied industries not connected to the public distribution network.

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.

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Level of water stress Compilation of the indicator (IV)

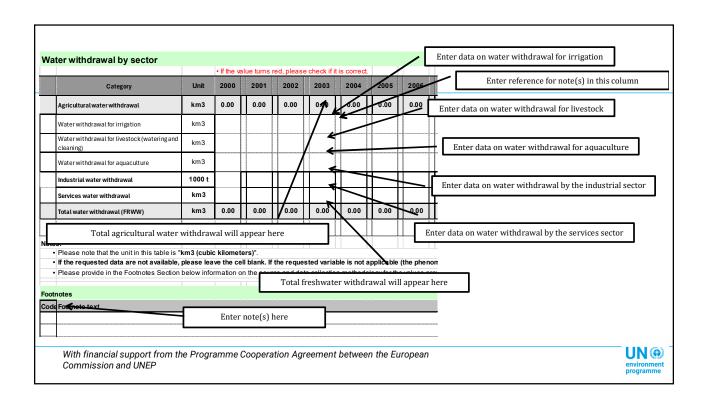
Services water withdrawal (km³/yr)

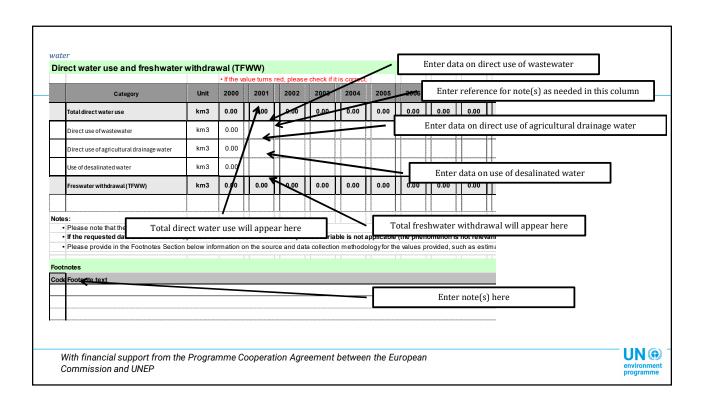
It is usually computed as the total water withdrawn by the public distribution network. It can include that part of the industries, which is connected to the municipal distribution network.

It is recommended to use the AQUASTAT questionnaires and the AQUASTAT water resources templates to collect the data required for the computation of the indicator.

As an alternative, the tables presented in SEEA-Water can be used.

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Level of water stress Compilation of the indicator (V)

Total renewable freshwater resources (TRWR) (km³/year)

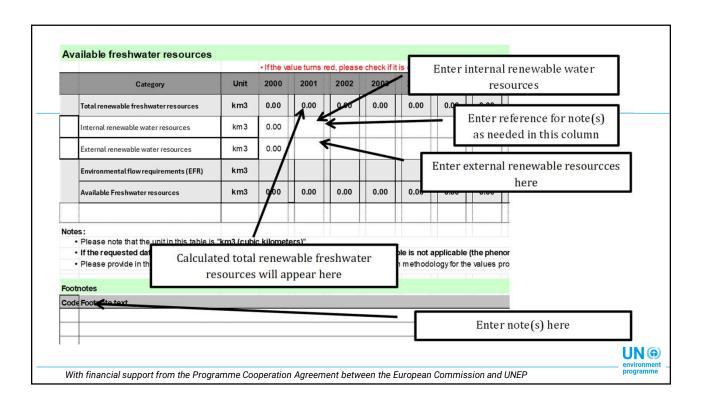
Total Renewable Water Resources (TRWR) is the sum of internal and external renewable water resources:

$$TRWR(km^3/year) = IRWR(km^3/year) + ERWR(km^3/year)$$

<u>Internal Renewable Water Resources (IRWR) (km³/year)</u>: The long-term average annual flow of rivers and recharge of aquifers generated from endogenous precipitation (resources produced within the territory).

<u>External Renewable Water Resources (ERWR) (km³/year)</u>: The part of the country's renewable water resources that is not generated within the country. It includes inflows from upstream countries (groundwater and surface water), and part of the water of border lakes or rivers.

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Level of water stress Compilation of the indicator (VI)

Environmental flow requirements (EFR)

Methods of computation of EFR are extremely variable.

Water volumes can be expressed in the same units as the TFWW.

EFR varies among different ecosystems and climates. The International Water Management Institute (IWMI) estimates a worldwide average EFR of about 30%.

From the perspective of water usage for human needs, there are forms of water utilization, such as navigation or recreation, which do not imply withdrawal but still require a water flow beyond the EFR. It is proposed to consider serious water scarcity at 70% as indicator's value.

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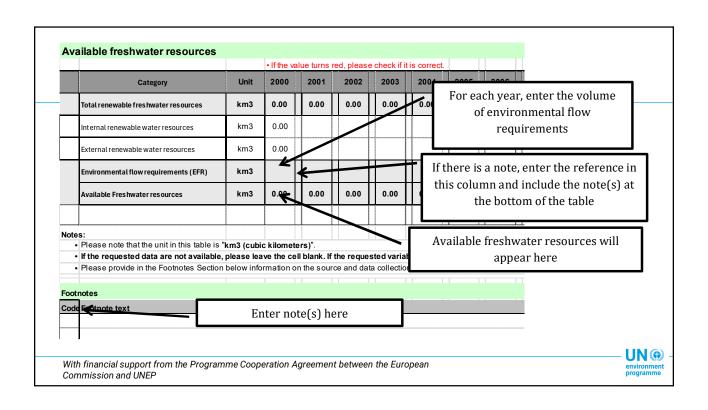
Level of water stress Compilation of the indicator (VII)

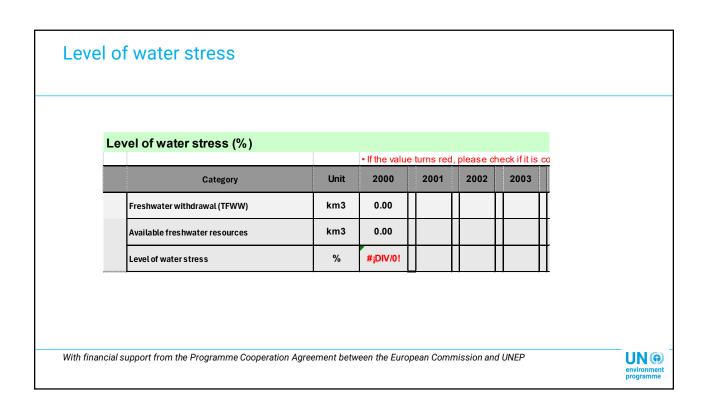
Environmental flow requirements (EFR)

In any case, the target for each country should be determined on a case-bycase basis, considering a variety of factors such as the level of development, the population density, the availability of non-conventional sources of water and the general climatic conditions.

FAO published the guidelines that provide a minimum standard method, principally based on the Global Environmental Flows Information System (GEFIS), http://www.fao.org/3/CA3097EN/ca3097en.pdf









Indicator 11: Total discharges to water bodies and share of total discharges safely treated.

Discharges to water bodies

The circular economy indicator *pollutant discharges from material extraction and processing to water bodies and share safely treated* is considered difficult to calculate due to data unavailability.

A proxy indicator is proposed: *proportion of domestic and industrial wastewater flows safely treated*, that corresponds to the SDG 6.3.1.

The methodology for this indicator is based on UNSD's <u>Metadata for 6.3.1 and UNEP's Step-by-step monitoring methodology for indicator 6.3.1</u> (2016).

SDG target 6.3. aims to 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.

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Proportion of domestic and industrial wastewater flows safely treated

Indicator 6.3.1

Total wastewater generated

Total wastewater treated

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Discharges to water bodies Interpretation

This indicator tracks the proportion of wastewater flows from households, services and industrial economic activities that are safely treated at the source or through centralized wastewater treatment plants before being discharged into the environment.

In a circular economy, ensuring the availability and quality of water needs to improve minimizing and significantly reducing different streams of pollution into water bodies.

This indicator provides information to decision makers and stakeholders to make informed decisions to accelerate progress towards reducing water pollution, minimizing release of hazardous chemicals and increasing wastewater treatment and reuse.



Discharges to water bodies Additional disaggregation (I)

Wastewater can be generated through private households and economic activities:

<u>Agricultural</u> (ISIC 01-03) . Wastewater generated from these activities for the most part enters the environment as non-point pollution and will not be monitored as part of the indicator.

Mining and quarrying (ISIC 05-09)

Manufacturing (ISIC 10-33)

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Discharges to water bodies Additional disaggregation (II)

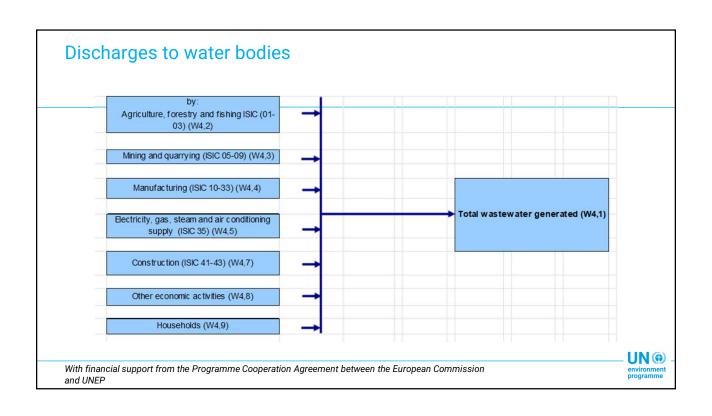
<u>Electricity</u> (ISIC 35). Water used for cooling in power generation is explicitly excluded from calculations of wastewater flows.

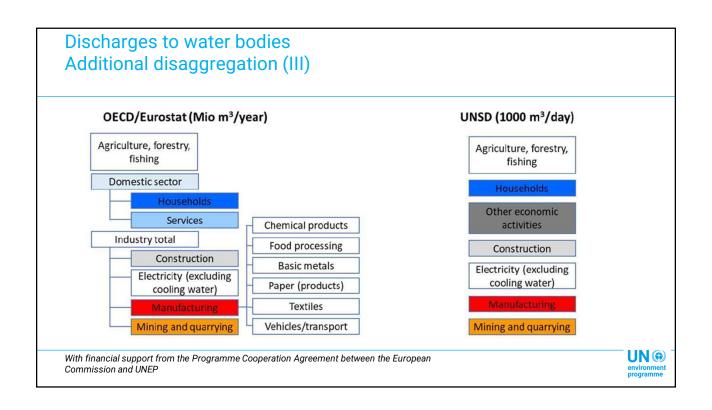
Construction (ISIC 41-43).

Services (ISIC 45-96)

Wastewater generated by residents of communal institutions may be covered under ISIC divisions, e.g. 85 (education) or 87 (residential care activities).







Discharges to water bodies Additional disaggregation (IV)

Differentiating between the different wastewater streams is important as policy decisions need to be guided by the polluter pays principle.

However, wastewater conveyed by combined sewers usually combines both hazardous and non-hazardous substances discharged from different sources, but also runoff and urban stormwater, which cannot be separately tracked and monitored.

As a consequence, although the flow of wastewater generated can be disaggregated by sources (domestic, services industrial), the treated wastewater statistics are most commonly disaggregated by type (e.g. urban and industrial) and/or level of treatment (e.g. secondary) rather than by sources.

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Discharges to water bodies Data availability

Total flows of wastewater generated and treated are reported by countries to UNSD and OECD/Eurostat databases.

At national level, data are collected from National Statistical Offices, ministries of environment, municipalities or regulatory authorities.



Discharges to water bodies Limitations in the use of the indicator (I)

There is a relative lack of knowledge about the volumes of wastewater generated and treated, because wastewater statistics are in an early stage of development in many countries.

Monitoring is relatively complex and costly.

A large proportion of the industrial water requirements are covered by the use of private systems using non-public/drinking water supply (groundwater, rivers and wells) which are not systematically included in national statistics.

Diffused pollution from non-point sources such as runoff from urban and agricultural land can contribute significantly to wastewater flows.

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Discharges to water bodies Limitations in the use of the indicator (I)

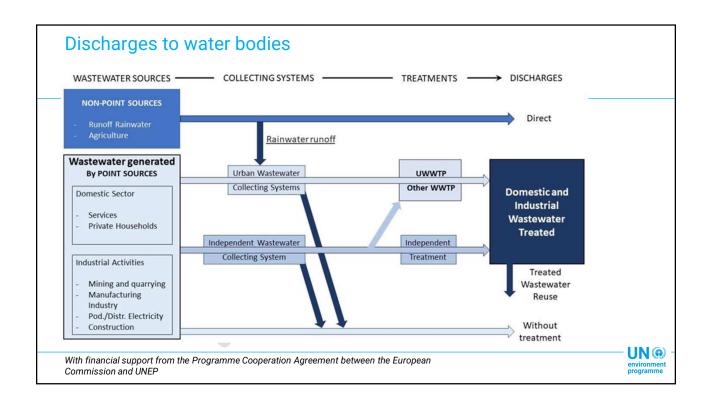
Different types of wastewater have different degrees of contamination and pose different levels of threat to the environment and public health.

Some data exist on the pollutant loading in terms of BOD_5 and COD (kg O_2 /day), but these are not as widely available as data on volumes.

Whether wastewater is classified as safely treated or not depends on the wastewater treatment plant's compliance rate to the effluent standards (i.e. performance). Many wastewater plants produce effluent which does not meet quality standards, due to improper design or loading.

Effluent standards rely on both national and local requirements, so this approach may not provide strictly comparable variables between countries.

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Discharges to water bodies Calculation

This indicator measures the volumes of wastewater which are generated through different activities, and the volumes of wastewater which are safely treated before discharge into the environment.

Both of these indicators are measured in units of 1,000 m³/day.

Wastewater flows will be classified into:

- Industrial
- Services
- Domestic flows



Total wastewater generated

In the absence of reported data on domestic wastewater generation, an estimate of the wastewater generated at the household level can be made. It can be estimated that 80% of the water supply which enters private households will subsequently exit the household as wastewater.

In the absence of other data on domestic water consumption, it can be estimated that households with on-premises water supply consume approximately 120 litres per capita per day, and therefore generate 96 litres of wastewater per capita per day.

Methodology is available at:

UNWater draft step by step monitoring methodology for sdg indicator 6 3 1 on wastewater treatment 2016.pdf



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Wastewater Generation Wastewater Generation If the value turns red, please check if it is correct. Line Unit 2002 2003 2004 2005 2006 Category 0 Total wastewater generated mio m³/v 0 0 0 0 mio m³/y Agriculture, forestry and fishing ISIC (01 03) 3 Mining and quarrying (ISIC 05-09) mio m³/y 4 Manufacturing (ISIC 10-33) mio m³/v Electricity, gas, steam and air 5 mio m³/y conditioning supply (ISIC 35) of which by: mio m³/y Electric pow er generation, transmission and distribution (ISIC 7 Construction (ISIC 41-43) mio m³/y 8 Other economic activities mio m³/v Households 9 mio m³/v

Total wastewater treated

Wastewater safely treated is calculated by summing wastewater flows which receive treatment considered equivalent to secondary treatment or better.

This wastewater flow is expressed in units of 1,000 m³/day.

Domestic wastewater which enters sewage lines can be assumed to reach centralized wastewater treatment plants, unless national data is available about leakage from sewage lines.

The volume of domestic wastewater estimated to reach treatment plants should be compared against the volume of wastewater reported to be received at wastewater plants.

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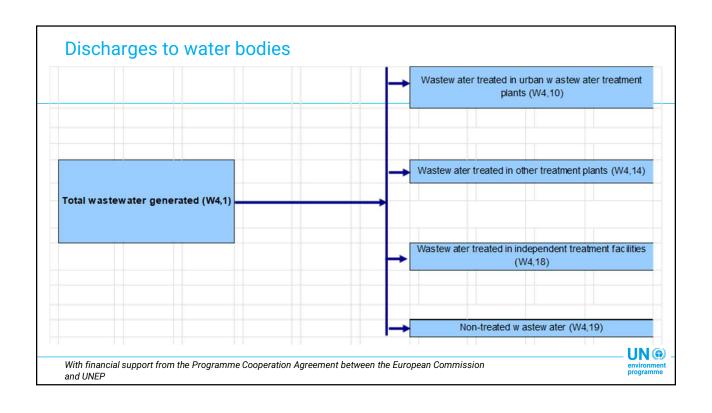
Discharges to water bodies

Wastewater safely treated

If data are available on the proportion of wastewater flows received by centralized treatment plants which receive secondary treatment or better, this proportion can be assumed to apply equally to the flows generated by households, industries, and services which discharge into public sewers.

Domestic wastewater which enters on-site storage and treatment systems such as septic tanks can be assumed to be safely treated if national data on compliance of on-site wastewater treatment systems to relevant standards are available. In the absence of such data, half of the wastewater discharged into on-site storage and treatment systems should be considered to receive safe treatment.





Wast	ewater Treatment						
		If the value turns red, please check if it is correc					
Line	Category	Unit	2002	2003	2004	2005	
	Total was tewater treated	mio m³/y	0		000000000000000000000000000000000000000	000000000000000000000000000000000000000	
10	Wastewater treated in urban wastewater treatment plants	mio m³/y					
11	of which:	mio m³/y				000000000000000000000000000000000000000	
	Primary treatment						
12	Secondary treatment	mio m³/y					
13	Tertiary treatment	mio m³/y		***************************************			
14	Wastewater treated in other treatment plants	mio m³/y					
15	of which:	mio m³/y				000000000	
15	Primary treatment					00000000	
16	Secondary treatment	mio m³/y				0.000	
17	Tertiary treatment	mio m³/y				0.000	
18	Wastewater treated in independent treatment facilities	mio m³/y					
19	Non-treated wastewater	mio m³/y				80000000	
20	Sew age sludge production (dry matter)	1000 t					_

Proportion of wastewater safely treated

 $Proportion \ of \ was tewater \ safely \ treated = \frac{\text{Total was tewater treated (million m3/year)}}{Total \ was tewater \ generated \ (million \ m3/year)} x \ 100 \ (\%)$

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Discharges to water bodies

