

6 CLEAN WATER AND SANITATION

Progress on Wastewater Treatment

Piloting the monitoring methodology and initial findings for SDG indicator 6.3.1

2018

UN WATER
World Health Organization
UN HABITAT

Progress on Safe Treatment and Use of Wastewater

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Cover photo: Maintenance of wastewater treatment plant in Lima, Peru. Photo: Kate Olive Medlicott

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:

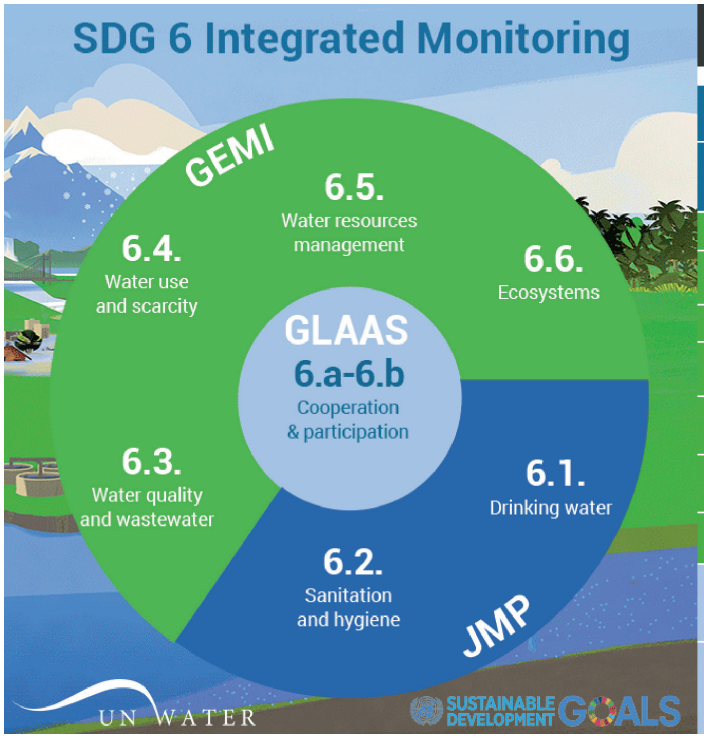
- **WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP)**[1]
  Building on its 15 years of experience from Millennium Development Goals (MDG) monitoring, the JMP looks after the drinking water, sanitation and hygiene aspects of SDG 6 (targets 6.1 and 6.2).
- **Integrated 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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Water flowing at a wastewater treatment facility. Photo: Shutterstock

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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.

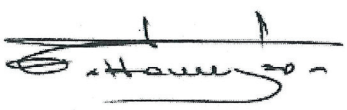
In this series of progress reports under the UN-Water Integrated Monitoring Initiative for SDG 6, we evaluate progress towards this vital goal. The United Nations organizations are working together to help countries monitor water and sanitation across sectors and compile data so that we can report on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



REPORT HIGHLIGHTS

Methodology development and testing

The monitoring methodology for indicator 6.3.1 was developed and tested in consultation with wastewater experts, national sector experts and statistical authorities, and harmonized with the International Recommendations for Water Statistics (UN DESA, 2012) and established regional monitoring mechanisms.

Preliminary data

Preliminary[1] estimates for domestic wastewater (6.3.1a) have been made for 79 mostly high- and middle-income countries, excluding much of Asia and Africa. Among these countries:

- 71 per cent of domestic wastewater flow is collected in sewers, 9 per cent is collected in on-site facilities and the remaining 20 per cent is not collected.
- 59 per cent of domestic wastewater flow is collected and safely treated. The untreated 41 per cent poses risks to the environment and public health.
- 76 per cent of domestic wastewater flow collected in sewers is safely treated.
- 18 per cent of domestic wastewater flow collected in septic tanks is safely treated.

Analysis for indicator 6.2.1 shows that worldwide, the number of households connected to sewers and to on-site systems such as septic tanks and pit latrines is approximately equal.

Estimates should be considered as upper limits because data are skewed towards higher-income countries, and because of assumptions applied where there are data gaps on treatment performance, drainage and sewer overflows.

There are insufficient data available to estimate treatment of industrial wastewater that flows (6.3.1b) into sewers and directly into the environment. Data on industrial discharges are poorly monitored and seldom aggregated at the national level.

Towards complete reporting on safe treatment and use of wastewater

Comprehensive reporting on indicator 6.3.1 is impeded by major data gaps relating to on-site treatment of domestic wastewater and permit records for industrial discharges. Disaggregation of pollution load by source according to households, services and industry (which can be further disaggregated by International Standard Industrial Classification (ISIC) codes) will assist in identifying heavy polluters and consequently, in applying the "polluter pays" principle to improve treatment. An additional indicator, on wastewater reuse, would respond to the full intent of indicator 6.3.1 and would inform target 6.4 on water scarcity.

Conclusion and next steps

The health of tens of millions of people is at risk from polluted surface waters. Managing wastewater by increasing wastewater collection and treatment (on-site and off-site) can help achieve the 2030 Agenda for Sustainable Development.

Political will is needed to regulate and enforce pollution control measures. Decision makers need to be better informed of pollution sources, levels of wastewater treatment and water quality to be able to prioritize investments that can best contribute to achieving target 6.3. SDG reporting can motivate countries to aggregate existing, subnational, wastewater data and publicly report it at the national level.

[1] Preliminary estimates are calculated using data available at the time of publication and may change.



Faecal sludge sampling in Kampala, Uganda. Photo: Lars Schoebitz

Performance monitoring of on-site and off-site wastewater treatment systems needs to be routinely implemented and permits on industrial discharges need to be enforced. Countries without national or local monitoring systems and standards should develop them, and developing local and national data leadership skills will play a significant role in improving monitoring mechanisms.

Choosing the most appropriate type of wastewater treatment system is site-specific, and as such, countries need to build capacity to assess and select treatment technologies. Developing strategies for supporting informal service providers to formalize their services will improve service quality and increase the volume and quality of treatment.

Wastewater should be considered a sustainable source of water, energy, nutrients and other recoverable by-products. A coordinated and pragmatic policy environment bringing together industry, utilities, health, agriculture and the environment is needed to promote innovative safe recycling and reuse of wastewater (WWAP, 2017).

The health of tens of millions of people is at risk from polluted surface waters. Managing wastewater by increasing wastewater collection and treatment (on-site and off-site) can help achieve the 2030 Agenda for Sustainable Development.

1

Monitoring safe wastewater treatment and reuse



Wastewater treatment plant. Photo: Ivan Bandura

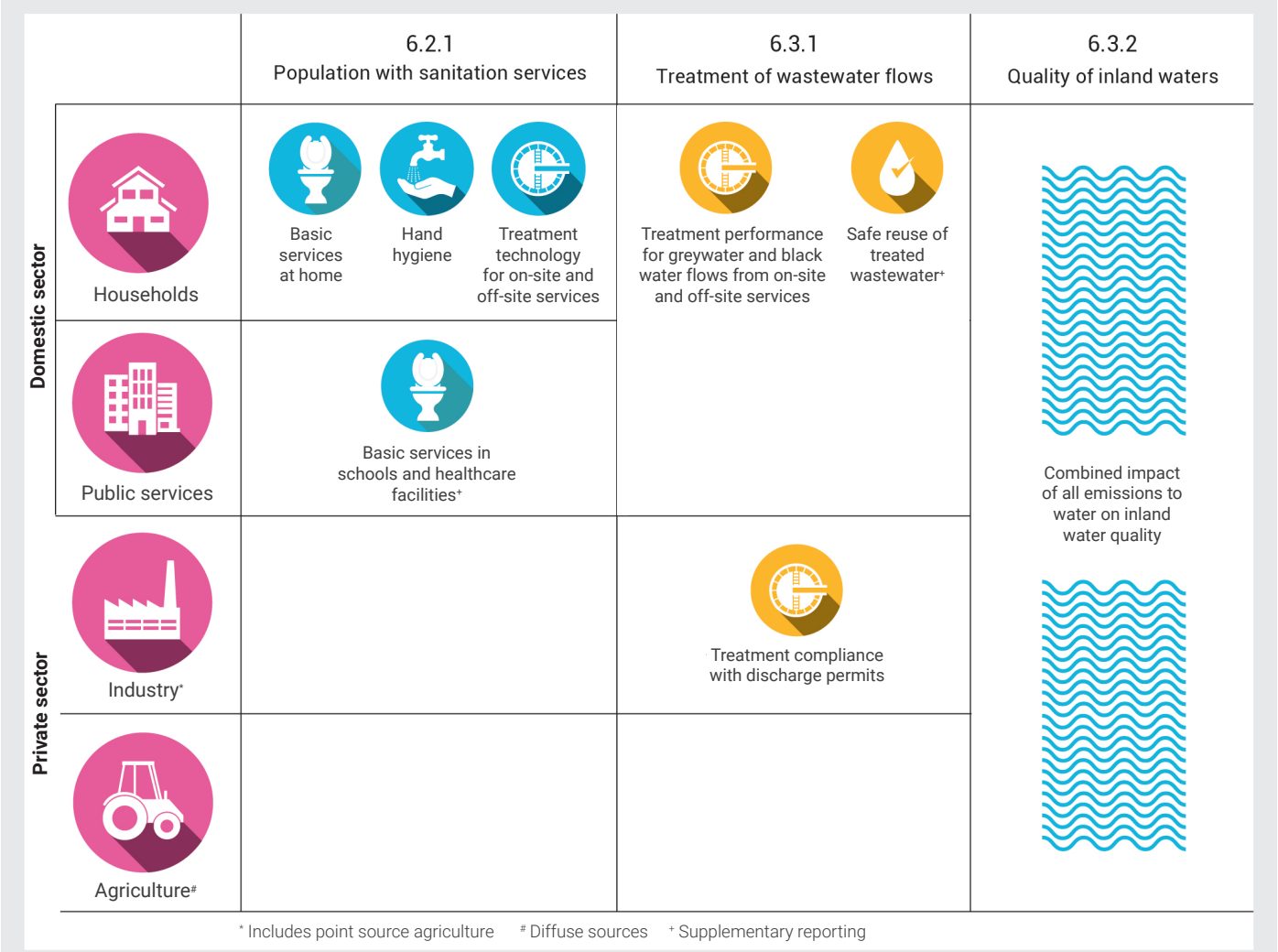
Poor water quality poses risks to public health, food security and other ecosystem services and functions. Untreated domestic wastewater contains pathogens, organics and nutrients, while wastewater from industrial and other establishments, apart from the organic load, may also contain a variety of hazardous substances, including heavy metals. Untreated wastewater contaminates the environment, causing widespread disease and damage to ecosystems. Ultimately, water pollution limits the opportunities for safe and productive use and reuse of water sources to augment freshwater supplies, particularly in water-scarce regions.

Target 6.3 calls for an improvement in water quality by halving the proportion of untreated wastewater and challenges countries to increase wastewater collection and treatment so that effluent consistently meets national standards. To do so, on-site and off-site domestic treatment technologies need to be in place and properly operated and maintained, and industrial wastewater generators need to be monitored and regulated through permits for discharges both into sewers and/or the environment. Removing hazardous pollutants at source and safely treating wastewater creates opportunities to increase safe reuse and in doing so, to combat water scarcity. It also contributes to realizing the human right to water and sanitation, especially the right not to be negatively impacted by unsafely managed wastewater.

Indicator 6.3.1 – "Proportion of wastewater safely treated" – defines wastewater as water that is of no further immediate value for the purpose for which it had been used or produced because of its quality, quantity or time of occurrence. Indicator 6.3.1 comprises two sub-indicators:

- 6.3.1a: Percentage of safely treated domestic wastewater flows
- 6.3.1b: Percentage of safely treated industrial wastewater flows

Figure 1: Linkages among indicators on sanitation, wastewater and water quality



Source: World Health Organization (from United Nations, 2018)

The sub-indicators assess actual treatment performance based on effluent-quality data and discharge permits, where available. By comparison, indicator 6.2.1 on safely managed sanitation measures delivery to a secondary or higher treatment technology.

Progress on SDG target 6.3 partly relies on progress towards universal access to sanitation (indicator 6.2.1), improvement in domestic wastewater treatment performance, industrial wastewater source control and treatment (6.3.1) and reducing diffuse pollution from agricultural and urban run-off. Diffuse pollution is difficult to monitor, and future methodologies need to account for the extent to which it contributes to pollution in tandem with point sources. Indicator 6.3.2 assesses the combined impact of all wastewater discharges (including diffuse agricultural run-off not covered in 6.3.1a and 6.3.1b) on inland ambient water quality (Figure 1). Water quality is also one of the sub-indicators of indicator 6.6.1 on water-related ecosystems.

Progress on SDG target 6.3 also contributes to progress on safe drinking water (target 6.1) and reduction in waterborne diseases (target 3.3). Increasing safe use of wastewater contributes to increasing food production (target 2.4) and improving nutrition (target 2.2), while also mitigating water scarcity (target 6.4), increasing water-use efficiency (target 6.4) and contributing to sustainable urbanization (target 11.2).

Table 1: Normative interpretation of the SDG 6.3 target language

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"	
Target language	**Normative definitions of target elements (for purposes of global monitoring)**
Improve water quality by	Implies adequate quality of receiving water bodies so that they do not present risks to the environment or human health as monitored by indicator 6.3.2
Reducing pollution	Implies minimizing production and discharge of pollutants from point sources (e.g. domestic (households and services) and industrial premises) and non-point sources (e.g. agricultural and urban run-off)
Eliminating dumping	Refers to illegal or uncontrolled disposal of liquid wastes
And minimizing release of hazardous chemicals and materials	Refers to minimizing use of hazardous chemicals and/or maximizing treatment prior to discharge into sewers or the environment
Halving the proportion of untreated wastewater	Untreated wastewater refers to discharges not meeting national standards for release into the environment or next use. Wastewater can refer to: a) Domestic wastewater – wastewater from households and services (e.g. commercial premises and institutions) - collected in sewers and treated at wastewater treatment plants - collected on-site and transported and treated off-site - collected and treated in situ b) *Industrial wastewater – from ISIC-classified premises* - collected in sewers and treated at wastewater treatment plants - collected and treated (if needed) on-site and discharged into the environment
And increasing recycling	Implies wastewaters recycled on-site or for another commercial or industrial use
And safe reuse	Implies use of wastewater by another sector (e.g. agriculture). "Safe reuse" is defined in WHO Guidelines for safe use of wastewater, excreta and greywater

2

Monitoring methodology – “Proportion of wastewater safely treated”



Informal settlements in Coxs Bazar, Bangladesh March 2018. Photo: Graham Alabaster

The monitoring methodology described below was developed and tested in consultation with wastewater experts, national sector experts and statistical authorities. The methodology has been harmonized with the International Recommendations for Water Statistics (UN DESA, 2012) and with established regional monitoring mechanisms. Details of the methodology development and testing process are described in section 3. Indicator 6.3.1 combines two sub-indicators:[2]

- *6.3.1a: Percentage of safely treated domestic wastewater flows*

  This sub-indicator measures the flow of safely treated wastewater (sewage treated at treatment plants, and wastewater from on-site facility treated on-site or emptied, transported and treated off-site) as a proportion of all domestic wastewater generated based on household per capita water-use data.

  "Domestic wastewater" is defined as wastewater flow from households and services, unless the service has an International Standard Industrial Classification (ISIC) code. "Safely treated" is defined as meeting national or local treatment standards for discharge of treated effluents.

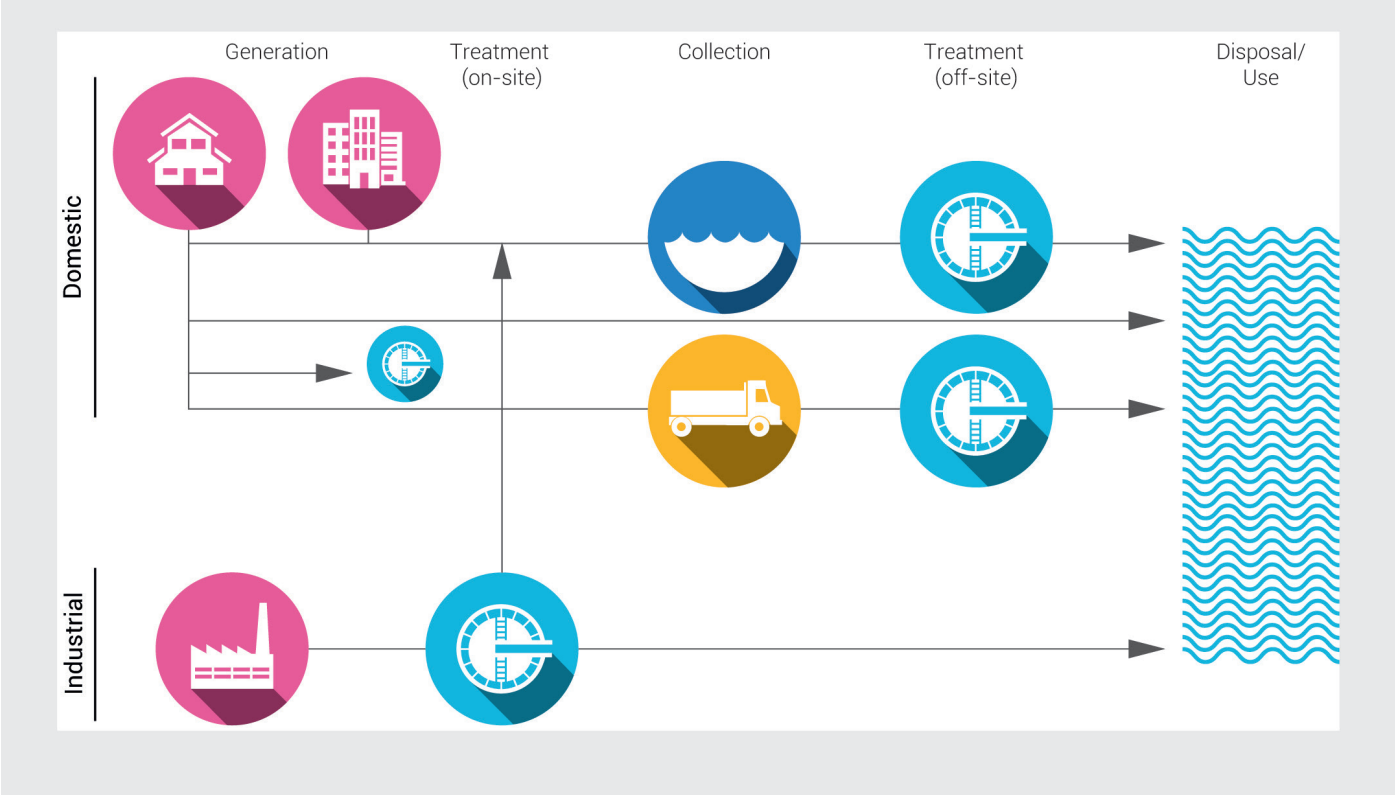
- *6.3.1b: Percentage of safely treated industrial wastewater flows*

  This sub-indicator measures volumes of industrial wastewater flows in compliance with regulations and discharge permits, as a proportion of all industrial wastewater discharged into sewers and the environment.

  "Industrial wastewater" is defined as flow from industrial premises as defined by ISIC classifications.

These sub-indicators may be able to be combined into a single indicator at a later stage, when more data are available on industrial wastewater and the respective pollution loads expressed in biological oxygen demand (BOD).

Figure 2: Schematic of wastewater generation, collection and treatment



[2] Subdivisions not yet approved by the Inter-agency Expert Group (IAEG).

6.3.1a: Percentage of safely treated domestic wastewater flows

Numerator: Volume of wastewater flows that are either:

a) flows transferred through sewers to a wastewater treatment plant, where they are treated in compliance with national and local standards

b) flows released into an on-site treatment system that is compliant with national and local standards

c) flows released into an on-site system that are emptied and transported to a treatment plant, where wastewater is treated in compliance with national or local standards

Denominator: Volume of wastewater flows generated by all households (including greywater)

Data handling and estimate calculation: The estimates for 6.3.1a draw on 18 variables in a service chain from generation to treatment (Table 1). Assumptions are used for variables for which data are not available. These assumptions are the same as those used for estimating indicator 6.2.1 (Table 1). Country estimates are only made if assumptions apply to less than 50 per cent of the population using each service type. The proportion of safely treated wastewater is determined either by performance data indicating the proportion of effluent meeting national standards, or technology data indicating treatment to secondary-level treatment or higher (or primary, with a long ocean outfall), when performance data are not available.

Table 2: Service chain variables, data sources and assumptions for domestic wastewater inventory

Variable No.	Variable name	Service type	Unit	Source	Assumption used where data not available
1	population		number	UNPD*	n/a
2	population with water on premises		%	JMP** 2015	n/a
3	population with water not on premises		%	JMP 2015	n/a
4	water use on premises		litre/person/day	JMP 2015	120
5	water use not on premises		litre/person/day	JMP 2015	20
6	piped sewers		%	JMP 2015	n/a
7	septic tanks		%	JMP 2015	n/a
8	other improved facilities		%	JMP 2015	n/a
9	unimproved facilities		%	JMP 2015	n/a
10	open defecation		%	JMP 2015	n/a
11	contained	piped sewers	%		100
12	delivered to treatment plant	piped sewers	%		100
13	contained	septic tanks	%		100
14	not emptied	septic tanks	%		50
15	emptied and removed off-site	septic tanks	%		50
16	delivered to treatment plant	septic tanks	%		100
17	treated at treatment plant	piped sewers	%	data sets reflecting treatment technology or national performance data	50
18	treated at treatment plant	septic tanks	%	as above	yes

** United Nations Population Division*
*** WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene*

Table 3: Example calculation of 6.3.1a, applying service chain variables

Population [thousands]	Water supply [%]		Water use [litre/person/day]*		Sanitation [%]		Wastewater [thousand m³/day]		Sanitation service chain [%]					Safely treated wastewater [%]			
	Population with water on premises	Population with water not on premises	On-premises	Not on-premises	Type	Population using type (including shared)	Generation [G]	Collection [C]	Contained	Emptied and removed off-site	Not emptied	Delivered to treatment plant	Treated at treatment plant	Wastewater treatment	Treated in situ	Faecal sludge treatment	6.3.1a
[1]	[2]	[3]	[4]	[5]	Piped sewers	[6]	=[6]x[1] x[4]*	=[G]x1	[11]	N/A		[12]	[17]	A = [C]x[11] x[12]x[17] /G(total)x100			
					Septic tanks	[7]	=[7]x[1] x[4]*	=[G]x1	[13]	[15]	[14]	[16]	[18]		B = [C] x[13]x[14] /G(total) x100	C= [C]x[13]x[16] x[18] /G(total)x100	=A+B+C
					Other improved facilities	[8]	=[8]x[1] x[5]*	=[G]x0	0	0	0	0	0		0	0	
					Unimproved facilities	[9]	=[9] x[1]x[5]*	=[G]x0									
					Open defecation	[10]	=[10] x[1]x[5]*	=[G]x0									
TOTAL							G(total)	C(total)									

** Actual calculation distributes "on-premises" water use [4] to households with sewer connections, then to septic tanks, then other service type, until all on-premises water is allocated, after which "not on-premises" [5] is applied.*

6.3.1b: Percentage of safely treated industrial wastewater flows

Numerator: Volume of wastewater flows that are released in compliance with regulations and discharge permits, either into:

a) a public sewerage network that connects to a wastewater treatment plant where wastewater is treated in compliance with local standards

b) the environment (whether after treatment or not)

Denominator: Total volume of industrial wastewater discharged into public sewers and the environment

Data handling and estimate calculation: Estimates for 6.3.1b draw on four variables to derive the percentage of safely treated industrial wastewater (Table 4). Variables are compiled at the country level in a national inventory of industrial emissions into water. The estimate is calculated using a weighted average of industrial flows meeting their permits divided by total flows. Where possible, both the numerator and denominator should be disaggregated by discharge into sewers or directly into the environment, and further disaggregated by ISIC industry classification, where this is available. If information on isolated industrial facilities is not available, the indicator will only reflect the compliance of discharges into public sewers.

Table 4: Service chain variables, data sources and assumptions for industrial wastewater inventory

Variable No.	Variable name	Unit	Source	Assumption used where data not available
1	industry type	ISIC code	data on compliance with discharge permits	n/a
2	industrial wastewater flow generated	m^3/year	data on compliance with discharge permits	n/a
3	permit compliance	yes/no	data on compliance with discharge permits	n/a
4	discharge to service type	into sewer or environment	data on compliance with discharge permits	n/a

Table 5: Example calculation of 6.3.1b for treated industrial wastewater

Industry type (aggregated by ISIC category)	Industrial wastewater flow generated m^3/year ($x10^6$)	Permit compliance	Industrial wastewater flow treated m^3/year ($x10^6$)	Discharge to service type
13. Manufacture of textiles	1.2	Yes	1.2	sewer
20. Manufacture of chemicals and chemical products	0.6	No	0	sewer
22. Manufacture of rubber and plastics products	0.5	No	0	environment
6. Extraction of crude petroleum and natural gas	2.2	Yes	2.2	sewer
17. Manufacture of paper and paper products	0.9	Yes	0.9	environment
35. Electricity, gas, steam and air-conditioning supply	0.7	No	0	sewer
86. Human health activities	0.1	yes	0.1	sewer
Total	**6.2 m^3/year ($x10^6$)**		**4.4 m^3/year ($x10^6$)**	
$\frac{\text{Total flow of industrial wastewater in compliance}}{\text{Total flow of industrial wastewater generated}}$		=	Percentage of industrial wastewater safely treated	
$\frac{4.4\ m^3/\text{year}\ (x10^6)}{6.2\ m^3/\text{year}\ (x10^6)}$		=	**71%**	

3

Methodology development and learnings from methodology testing



Pipe cleaning in Kampala, Uganda. Photo: Lars Schoebitz

Methodology development and testing process

The methodology for indicator 6.3.1 was developed in 2015/16 in consultation with wastewater experts, national sector experts and statistical authorities and the United Nations Statistics Division (refer to acknowledgements) by means of two face-to-face expert meetings and a treatment working group operating through remote meetings. Additional feedback on methodologies was also sought through consultations with the UN-Water members and partners who provided written submissions for consideration and incorporation into the methodology.

Development and testing of domestic and industrial wastewater monitoring methods was conducted in parallel. The domestic wastewater methodology was harmonized with that of indicator 6.2.1 – "Proportion of population using safely managed sanitation services" – which relies on a similar service chain and similar national data sources. Inception workshops and pilot testing were initiated in nine countries and feedback from these was incorporated into the methods used to calculate the preliminary estimates presented in this report. A joint data drive, reaching out to all countries, was conducted in 2016 in coordination with the World Health Organization/United Nations Children's Fund Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (WHO/UNICEF JMP).



Wastewater discharge into the sea is the most common form of final wastewater disposition.

Table 6: Timeline of events

Timeline	Event
September 2014	Expert and stakeholder scoping meeting, London, UK
February 2016	Expert group meeting, Geneva, Switzerland
February 2016	Methodology feedback from UN-Water members and partners
March – July 2016	Treatment working group
July – December 2016	Data drive in conjunction with indicator 6.2.1
April 2016 – December 2017	Inception workshops and pilot testing carried out in Uganda, Senegal, Philippines, Peru, Jordan, Netherlands, Viet Nam, China and Bhutan
March 2017	Inter-agency Expert Group (IAEG) upgrade indicator 6.3.1 to Tier 2
November 2017	Global stakeholder workshop, The Hague, Netherlands
March 2018	Expert group meeting, Geneva, Switzerland

Key feedback from countries and stakeholders

The following key themes emerged from the stakeholder consultations, expert reviews and country testing:

- The indicator should account for all wastewater generation, including blackwater and greywater production.
- Estimates of wastewater flows generated should be calculated as a proportion of water consumption flows for water supplies on- and off-premises.
- The indicator should assess actual treatment performance against national standards, taking into account the environmental and public health sensitivity of the receiving water and next use.
- The monitoring mechanism should draw on and harmonize with existing regional monitoring mechanisms (e.g. Eurostat, African Ministers' Council on Water (AMCOW)) to avoid placing additional reporting burden on national statistical authorities that are already stretched.
- There was a range of monitoring capacities among countries; as such, they requested flexibility on progressive monitoring approaches, relevant to the country's capacity level.
- Most countries measure wastewater treatment plant performance by testing effluent water quality; however, in most countries, regulatory authorities do not aggregate data at the national level.
- Few countries collect data on treatment performance of on-site systems (i.e. septic tanks) despite a significant proportion of the population using them in all countries and the majority of premises using them, especially in low- and middle-income countries.
- Permits for industrial discharges into sewers and the environment cover a small proportion of total industrial discharges in countries. Where permits are issued, they are often not checked for compliance and compliance data are not aggregated to the national level.
- National responsibilities for monitoring domestic and industrial wastewater treatment often fall to line ministries (i.e. public services and industry) and are reported through different reporting mechanisms. In many cases, this makes combining data into a single indicator challenging.
- However, stakeholders also highlighted the need to promote the polluter pays principle to drive and prioritize action towards achieving target 6.3. To do this, a degree of aggregation and differentiation of pollutant load by domestic and industrial sources is needed.

BOX 1

Country example – Co-treatment of wastewater and faecal sludge in Uganda

Only 1 per cent of the urban population in Uganda is connected to sewers and 27 per cent has improved on-site facilities. Currently, the National Water and Sewage Corporation (NWSC) of Uganda operates 25 treatment plants nationwide. Of these, 24 are designed to receive solely wastewater and one is designed to co-treat faecal sludge from on-site facilities with wastewater from sewers. The majority of the wastewater treatment plants use a combination of primary and secondary treatment technologies. The co-treatment facility includes dewatering and drying of faecal sludge and co-treats the liquid fraction along with primary treated wastewater.

The treatment plant designed for co-treatment of faecal sludge achieves 79 per cent compliance with national BOD standards for effluent, compared with 67 per cent, 42 per cent and 33 per cent compliance for the plants not designed to receive faecal sludge. This example highlights the impact that overloading with high-strength influent can have on treatment plant performance.

The NWSC has two large-scale, faecal sludge treatment facilities at the planning and design phase for Kampala, as well as upgrades to the main wastewater treatment plant and up to 50 small facilities are planned to serve towns. With construction of these new plants, proper management of wastewater is likely to increase over the SDG period, reducing exposure to untreated wastewater and incidence of sanitation-related diseases.

4

Results and analysis



Treated wastewater for agricultural reuse in Lima, Peru. Photo: Kate Olive Medlicott

6.3.1a: Percentage of safely treated domestic wastewater flows

Preliminary[3] estimates for domestic wastewater have been made for 79 mostly high- and middle-income countries, excluding much of Asia and Africa. Preliminary domestic estimates cover households only, and are derived from 120 data sources for 149 data points. Of these data sources, 111 out of 120 are from 2010 or more recently. Below is a summary of the findings:

- 71 per cent of domestic wastewater flow is collected in sewers, 9 per cent is collected in on-site facilities and the remaining 20 per cent is not collected.
- 59 per cent of all domestic wastewater flow is collected and safely treated. The untreated 41 per cent poses risks to the environment and public health.
- 76 per cent of domestic wastewater flow collected in sewers is safely treated.
- 18 per cent of domestic wastewater flow collected in on-site facilities is safely treated.

Estimates should be considered as upper limits because data are skewed towards higher-income countries, and there are data gaps on treatment performance.

Comprehensive reporting on 6.3.1a is impeded by major data gaps relating to on-site treatment of domestic wastewater, as well as drainage and sewer overflows.

Analysis for indicator 6.2.1 shows that worldwide, the number of households connected to sewers and to on-site systems such as septic tanks and pit latrines is approximately equal.

Treatment plant performance

Country wastewater estimates for 28 out of 79 countries are based on reliable performance data that reflect whether treatment is complying with national or regional standards (Map 2). The remaining 51 country estimates are based on treatment technology data.[4] Treatment performance more accurately reflects impacts of overloading, unpermitted industrial discharges and poor operation and maintenance of treatment plants on effluent quality.

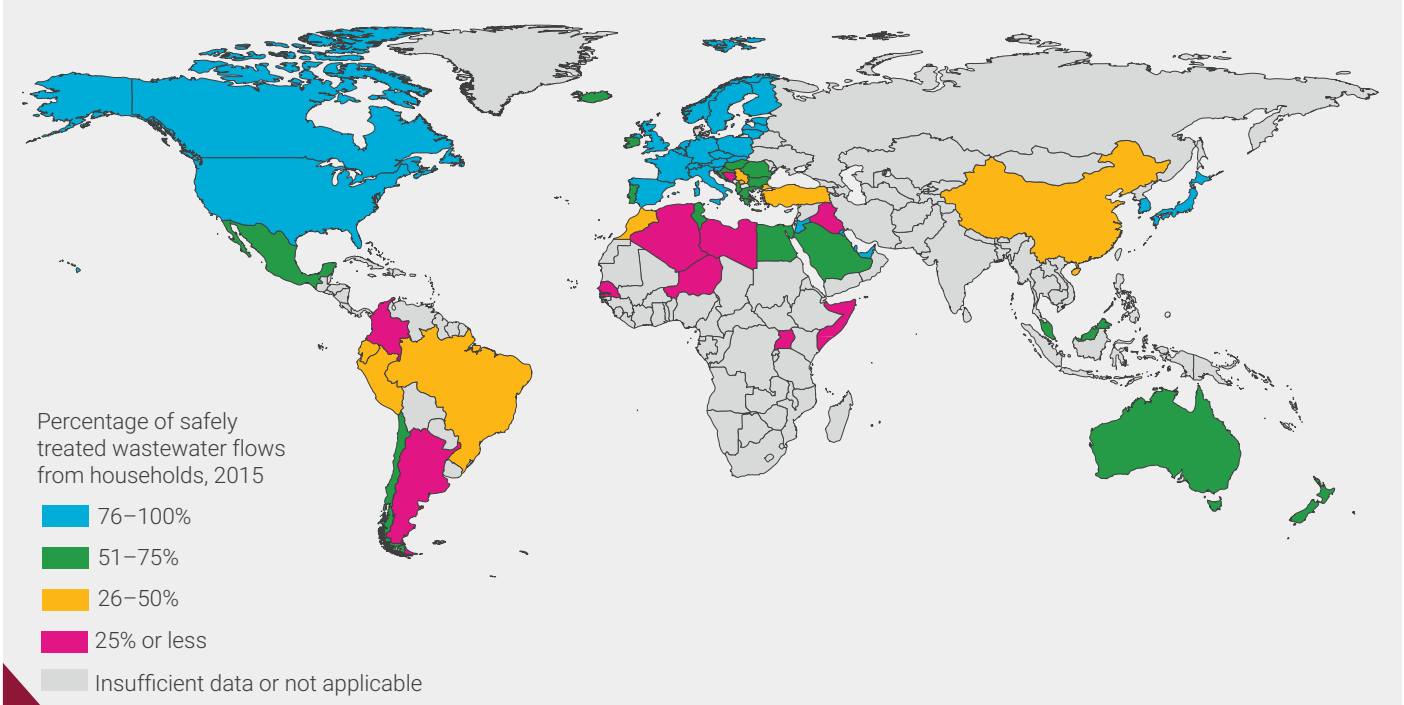
Performance data are most widely available in Europe, through reporting under the European Urban Wastewater Treatment Directive (UWWTD),[5] and in several countries outside Europe, from national performance reports. Based on article 4 of the UWWTD, a treatment plant is compliant if BOD concentrations of treated water effluent are 25 mg/l or lower and if the minimum percentage of reduction is 70 to 90 per cent. The UWWTD database includes a pass/fail variable that indicates this compliance with performance criteria. Within Europe, treatment plant performance is generally above 80 per cent; however, treatment performance as low as 20 per cent elsewhere indicates that some treatment plants are not functioning as intended due to poor operation and maintenance, over- or under-loading, or due to unregulated industrial discharges (Figure 3).

Connection to sewers and septic tanks

Thirty-six per cent of the global population, predominantly in high-income countries, is connected to sewers. Low- and middle-income countries generally have on-site facilities and do not collect data on treatment for these. Fifteen per cent of the global population is connected to septic tanks that collect household blackwater and greywater; the remaining 49 per cent uses latrines or has no sanitation facilities to collect blackwater. No data are available on greywater drainage facilities for households that use latrines or have no sanitation facilities.

[3] Preliminary estimates are calculated using data available at the time of publication and may change.
[4] Where secondary treatment or higher, or primary treatment with a long ocean outfall is considered safely treated.
[5] European Urban Waste Water Treatment Directive (UWWTD) accessible at: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX-:01991L0271-20140101&from=EN

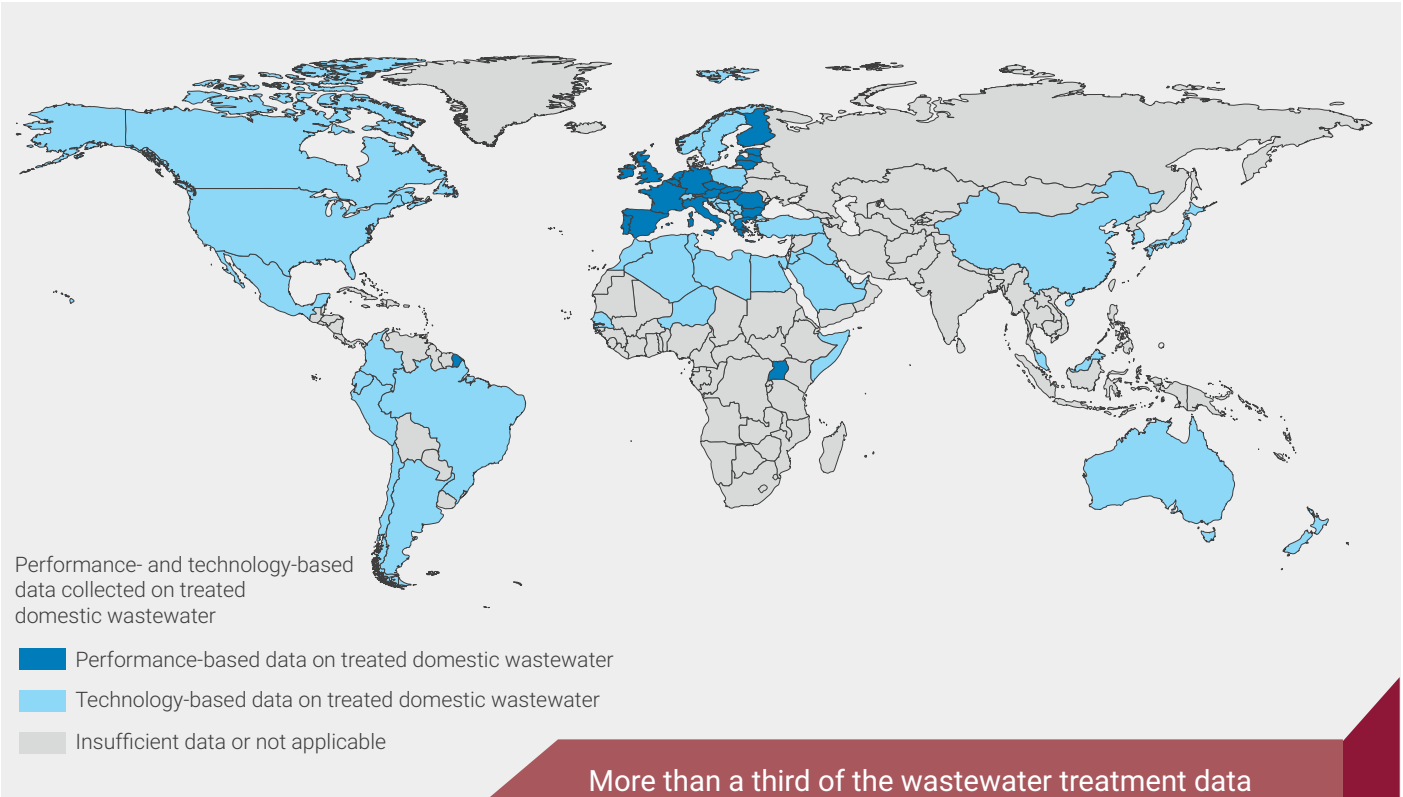
Map 1: Preliminary estimate for domestic wastewater treatment (6.3.1a)



In 22 of the 79 countries with data, percentage of safely treated wastewater flows from households is 50% or less

Source: United Nations, 2018

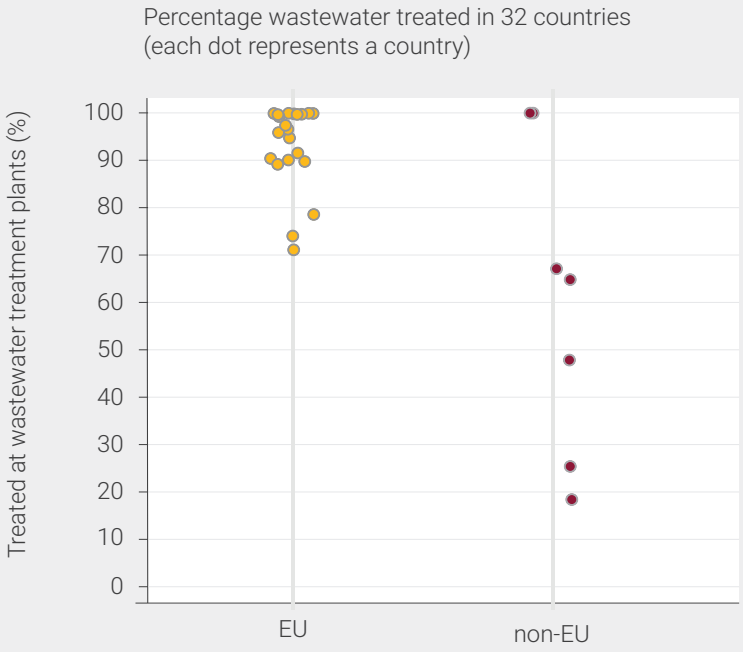
Map 2: Countries for which preliminary estimates for 6.3.1a are derived from performance data



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

Source: United Nations, 2018

Figure 3: Variability of treatment performance across countries



Source: United Nations, 2018

BOX 2

Losses and leakages from sewers

Untreated spills and overflows from the wastewater network to the environment pose risks to public health and the environment. Safe management of wastewater therefore includes preventing losses from the sewer network.

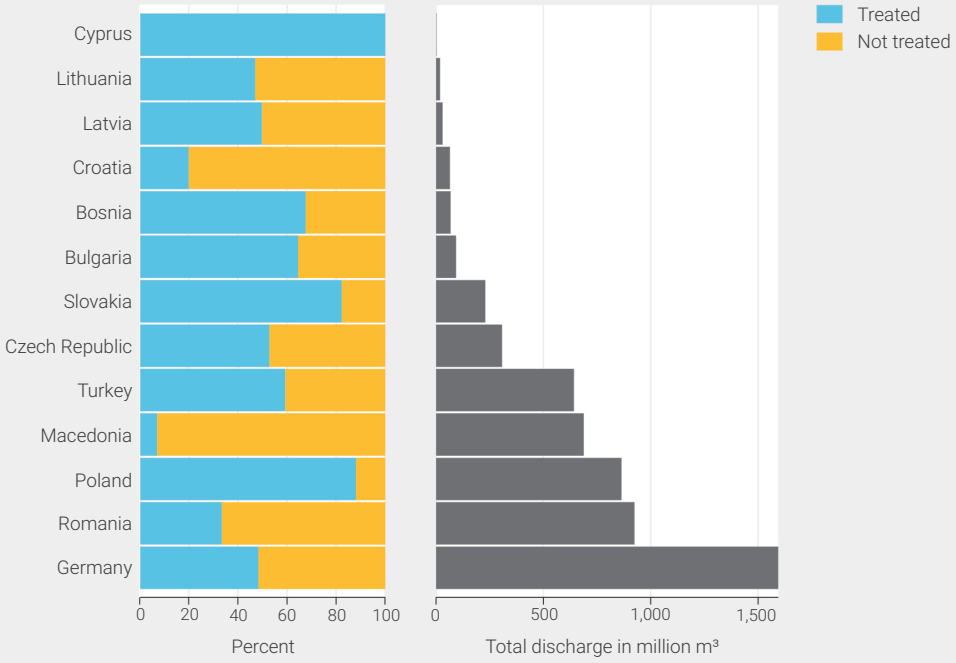
Most countries do not routinely report on sewer overflows; however, certain examples highlight the extent to which overflow frequency varies between countries. Australia and New Zealand reported one and 10 sewer overflows per 10,000 connections, respectively, in 2015. By comparison, in Thimphu municipality in Bhutan, 507 sewers were un-blocked by municipal trucks in 2016. If sewer blockages are assumed to equate to sewer overflows, this amounts to 3,160 overflows per 10,000 connections – a rate 300 times higher than in New Zealand.

6.3.1b: Percentage of safely treated industrial wastewater flows

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; however, many sources of industrial wastewater discharge into sewers and are co-treated with domestic wastewater. As such, the aforementioned estimates for domestic wastewater treatment provide some insight into the level of treatment of industrial wastewater discharged into sewers. Below is a summary of the findings:

- At present, there are insufficient data available to estimate industrial wastewater flows into sewers and directly into the environment, from any regions in the world, for 6.3.1b.
- Example estimates for industrial wastewater treatment are available for 13 countries (Figure 4).
- Data on industrial discharges are poorly monitored and seldom aggregated at the national level. In most countries, discharge permit records are kept at the utility or municipal level or by environmental protection agencies and are rarely aggregated and reported at the national level.
- Collection and aggregation of discharge data sorted by ISIC code is needed to enable complete reporting on 6.3.1b (this could be achieved by issuing permits and ensuring that industries comply with them).
- Comprehensive reporting on 6.3.1b is impeded by major data gaps relating to permits records, especially for industrial discharges into the environment.

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.

National standards for wastewater treatment

A review of national wastewater effluent standards analysed 100 countries and collated 275 national standards covering multiple wastewater effluent-quality requirements. National standards, most commonly issued by environmental ministries, normally propose organics and nutrient parameters as the primary measures of treatment. Acceptable levels vary according to source, disposal and reuse type.

Better alignment of national standards with global norms would facilitate comparability of global data and in some cases, could improve the quality of national standards.

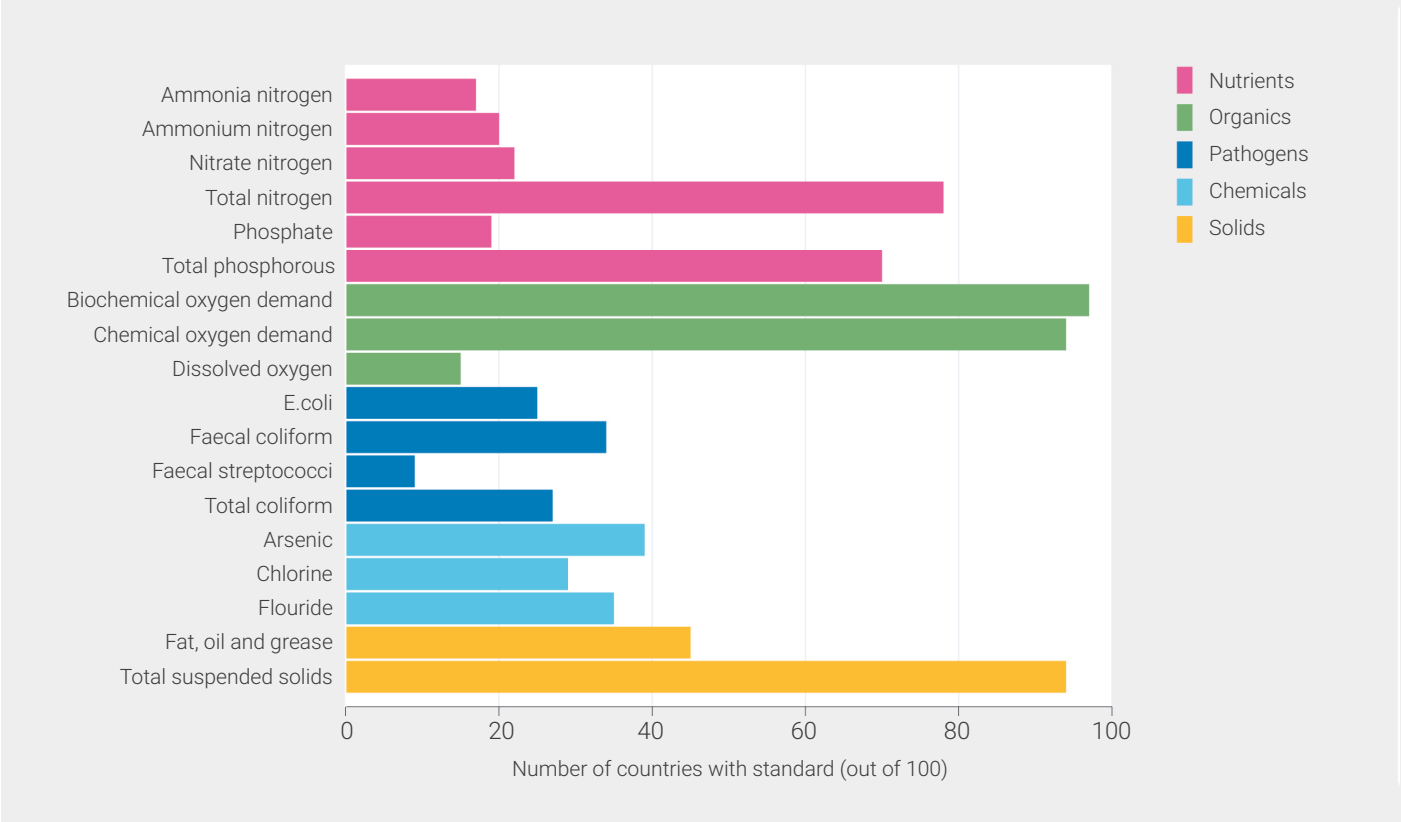
Wastewater treatment technologies are often categorized as primary, secondary, tertiary and advanced treatment technologies; however, such categorization and treatment standards do not exist for wastewater and sludge from on-site facilities.

Safe use of wastewater

Target 6.3 calls for a substantial increase in the safe reuse of wastewater. Data on use and disposal of wastewater and sludge are routinely collected in some regions to inform responses to water scarcity and pollution. The arid Arab States have proactive policies that address water scarcity and monitor progress. Jordan, Kuwait and Oman use at least secondary treatment prior to use in agriculture (Figure 7); other countries still have significant proportions of untreated wastewater, which represent opportunities to increase treatment and productive use for irrigation and groundwater recharge.

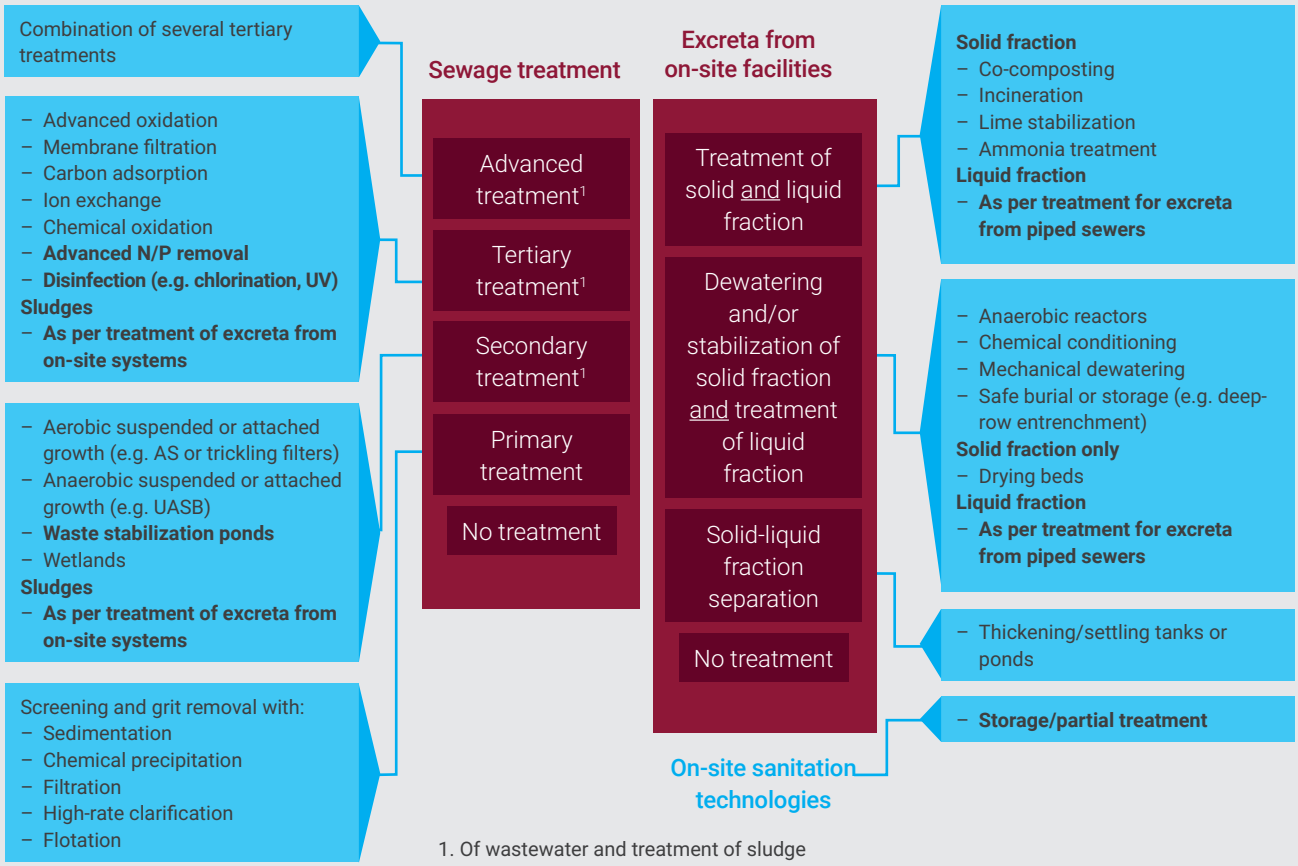
Including a sub-indicator on reuse at the country and regional level, or as part of future revisions of the SDG indicator framework, would address the intent of the target language (Table 1) more comprehensively. Definitions of "safe reuse" are needed for monitoring purposes, in which required levels of treatment correspond to the level of risk to human health and environment for each reuse type.

Figure 5: Summary of national standards for wastewater



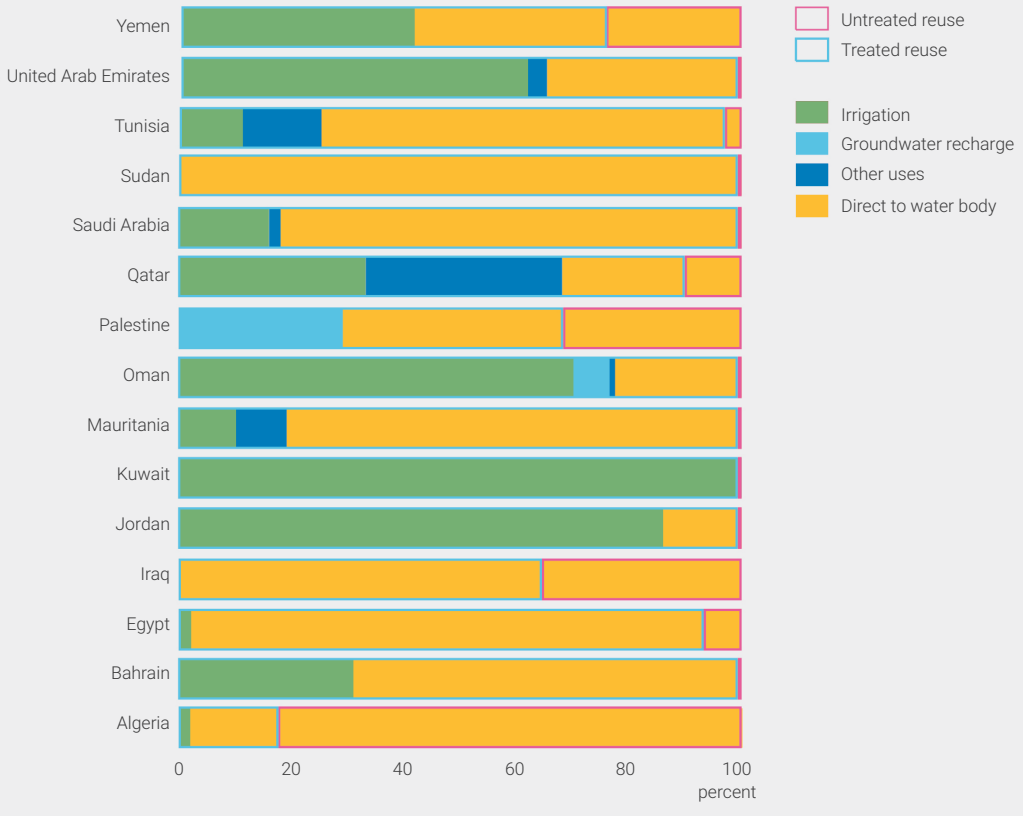
Source: WHO, 2017 (unpublished)

Figure 6: Description of treatment types



1. Of wastewater and treatment of sludge

Figure 7: Monitoring of wastewater reuse in Arab States



Source: Arab Countries Water Utilities Association (ACWUA), 2016

5

Towards comprehensive monitoring of safe wastewater treatment and reuse



Sewage treatment plant in Kavoor, Mangalore, India. Photo: Asian Development Bank

Indicator 6.3.1 – "Proportion of wastewater safely treated" – does not capture all the elements of safe wastewater management described in the SDG 6.3 target language (Table 1), especially eliminating dumping, minimizing release of hazardous chemicals and increasing safe reuse. As country monitoring capacity increases, national authorities can progressively improve monitoring systems to capture all wastewater generation and actual treatment performance. Comprehensive wastewater monitoring comprises:

1. monitoring household wastewater treated on-site and off-site to national or local standards

2. monitoring wastewater generated and treated from services

3. issuing permits and monitoring compliance of industrial discharges into sewers and the environment

4. monitoring the proportion of wastewater reused, disaggregated by treatment level and use

Countries can progressively begin monitoring aspects according to their national priorities.

Combining 6.3.1a and 6.3.1b into a single meaningful indicator may be possible if data are available on wastewater generation and treatment, expressed as pollution loads measured as BOD. Disaggregation of pollution load by source according to households, services and industry (which can be further disaggregated by ISIC codes) will assist in identifying heavy polluters and consequently, in applying the polluter pays principle to eliminate dumping, minimize release of hazardous chemicals and improve treatment.

An additional sub-indicator at the national, regional or global level on safe use of wastewater would respond to the full intent of indicator 6.3.1 and would inform national reporting for target 6.4 on water scarcity.

BOX 3

Example of combined national reporting of domestic and industrial wastewater

Mexico's national performance report disaggregates municipal and non-municipal discharges by flow and tons of five-day biological oxygen demand (BOD5). Loads from non-municipal sources measured in BOD5 are five times greater than those from municipal sources. Mexico also reports that 28 per cent of treated wastewater is directly reused. This example demonstrates the importance of filling data gaps on industrial wastewater discharged directly into the environment because this can represent a high proportion of total wastewater. It also demonstrates how data can be combined at the national level to cover all aspects of 6.3.1

Urban centres (municipal discharges)

Volume		
Municipal wastewater	7.23	thousand hm^3/year (229.1 m^3/s)
Collected in sewerage systems	6.69	thousand hm^3/year (212.0 m^3/s)
Treated	3.81	thousand hm^3/year (120.9 m^3/s)
Polluting load		
Generated	1.95	million tons of BOD_5 per year
Collected in sewerage systems	1.81	million tons of BOD_5 per year
Removed in treatment systems	0.84	million tons of BOD_5 per year

Non-municipal uses, including industry

Volume		
Non-municipal wastewater	6.77	thousand hm^3/year (214.6 m^3/s)
Treated	2.22	thousand hm^3/year (70.5 m^3/s)
Polluting load		
Generated	10.15	million tons of BOD_5 per year
Removed in treatment systems	1.49	million tons of BOD_5 per year

Source: CONAGUA (2016a), CONAGUA (2016b)

6

Conclusion



Wastewater truck in rural Bangladesh. Photo: Kate Olive Medlicott

Pollution of surface waters is putting the health of tens of millions of people at risk (UNEP, 2016). Untreated wastewater contaminates drinking-water sources, irrigation water used to grow fresh produce and recreational bathing water sites.

Managing wastewater by increasing wastewater collection and treatment (on-site and off-site) can help achieve the 2030 Agenda. Choosing the most appropriate type of wastewater treatment system that can provide the most co-benefits is site-specific, and countries need to build capacity to assess this.

Management of wastewater and water quality also needs to incorporate better knowledge of pollution sources. SDG reporting could support countries in aggregating subnational wastewater data and publicly reporting at the national level. This would include monitoring performance to ensure treatment plants are sufficiently managed and maintained to deliver effluent suitable for safe disposal or use according to national standards, which may vary from country to country. Countries that do not have national standards and monitoring systems in place need to assess performance of on-site and off-site domestic wastewater treatment systems. Moreover, the informal sector needs to be formalized through various policy instruments to prevent excessive contamination. Incentives for the informal sector to be registered with the Government could be accompanied by combined analysis of all wastewater sources and their relative contribution to health and environmental risks. This would enable countries to prioritize investments in pollution control that can best contribute to achieving SDG target 6.3.

Wastewater should be considered a sustainable source of water, energy, nutrients and other recoverable by-products, rather than a burden. Reuse of water needs to take into account the whole river basin, as wastewater from one part of a basin may well be the supply for other communities and uses downstream. A coordinated and pragmatic policy environment bringing together industry, utilities, health, agriculture and the environment is needed to promote innovative safe recycling and reuse of wastewater (WWAP, 2017).

Pollution, climate change, conflicts, water-related disasters and demographic shifts are putting unprecedented pressure on water resources in many regions of the world. More information on these complex linkages will aid decision makers in their tasks; however, political acceptability to regulate pollution and policy implementation are two of the main barriers to addressing the water pollution challenge, in addition to gaps in data.

The evidence available to inform decision-making will always be unreliable to some degree, as demonstrated by the emergence of new pollutants and the identification of diffuse pollution sources; however, this should not impede "no-regrets" investment in pollution control.

Wastewater should be considered a sustainable source of water, energy, nutrients and other recoverable by-products, rather than a burden.

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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 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

Leaking latrines and raw wastewater can spread disease and provide a breeding ground for mosquitoes, as well as pollute groundwater and surface water. In this report, you can learn more about wastewater monitoring and initial status findings.

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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